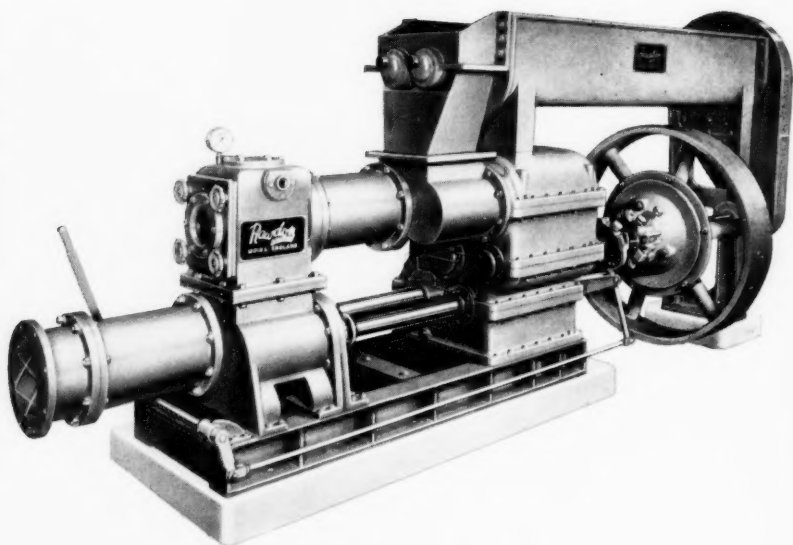


CERAMICS

JUNE
1953

No. 52 Vol. V

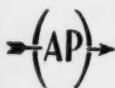


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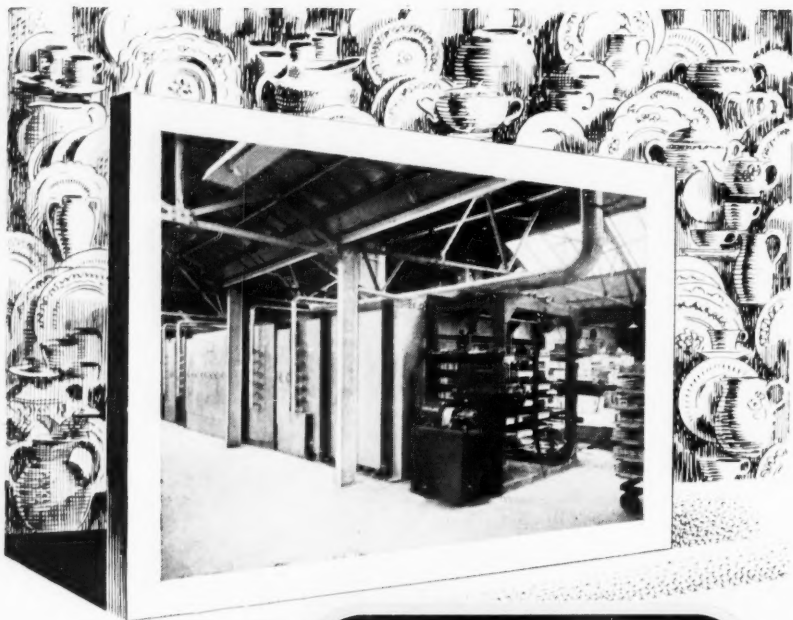
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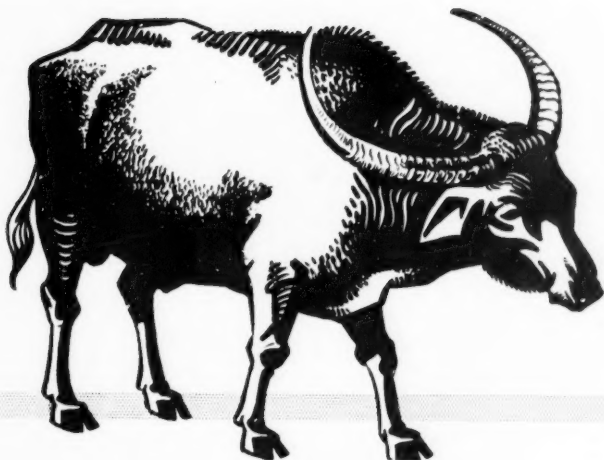
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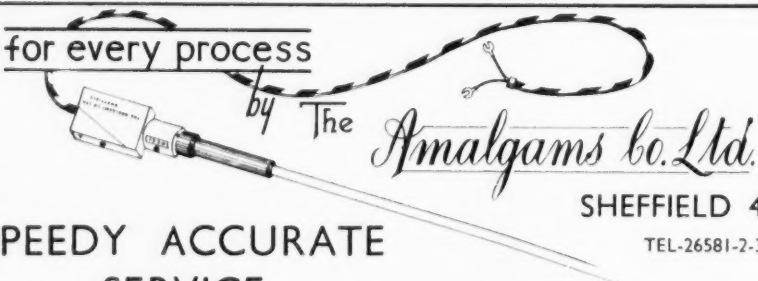
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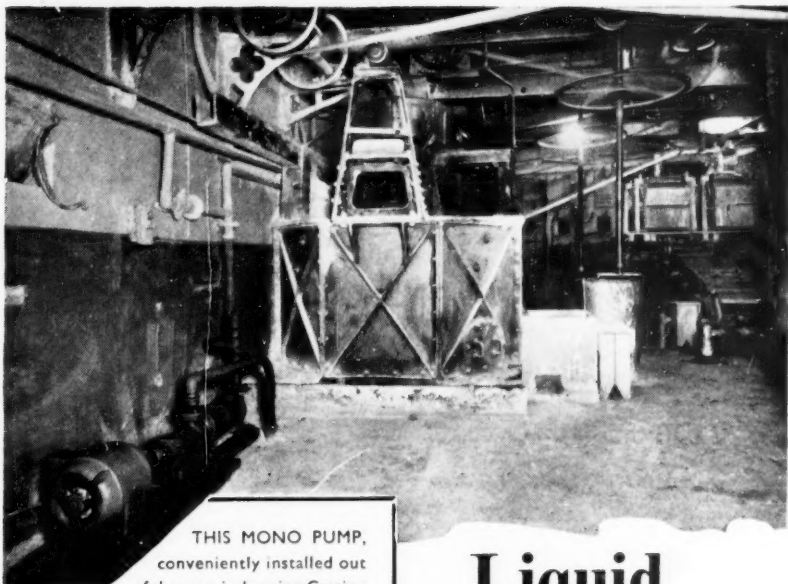
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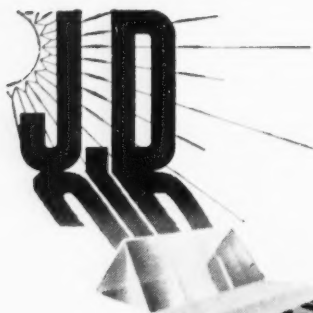
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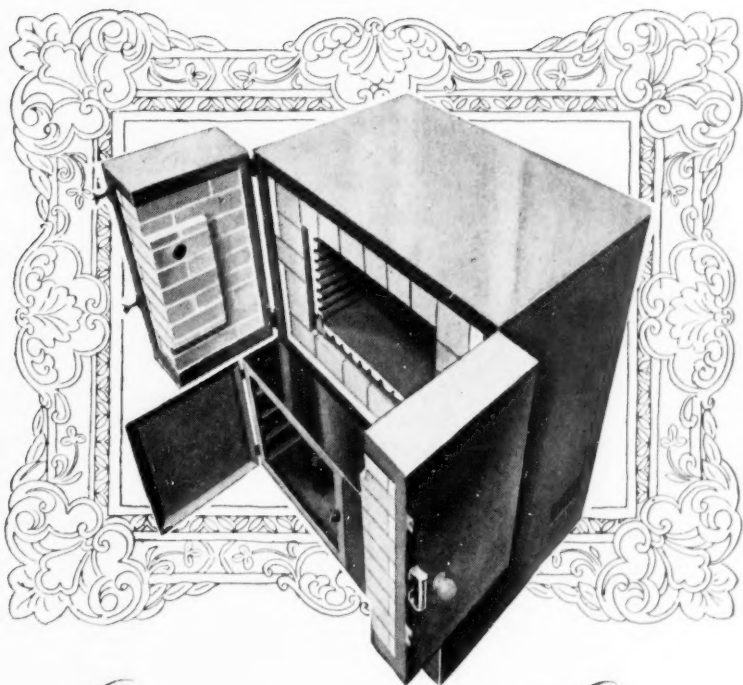


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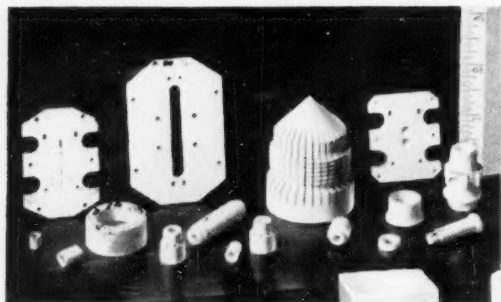
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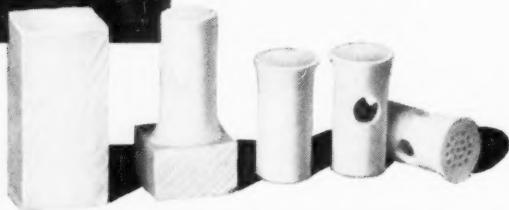


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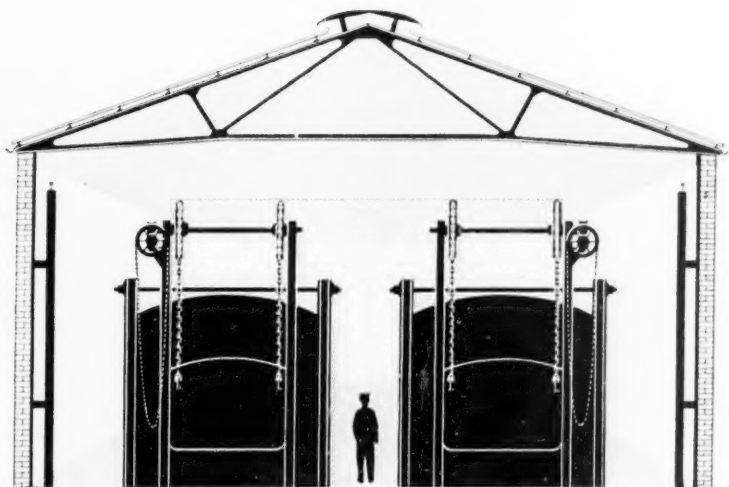
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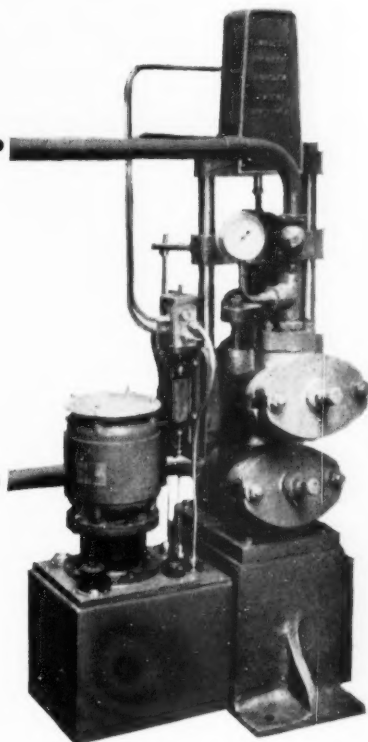
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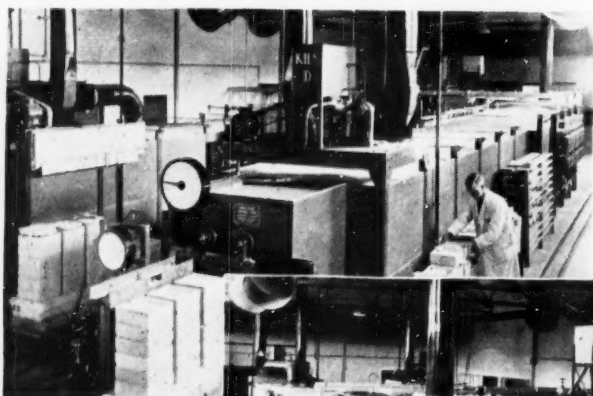
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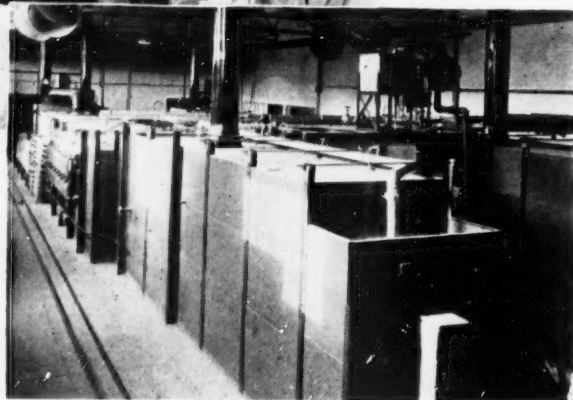
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CERAMICS

JUNE 1953

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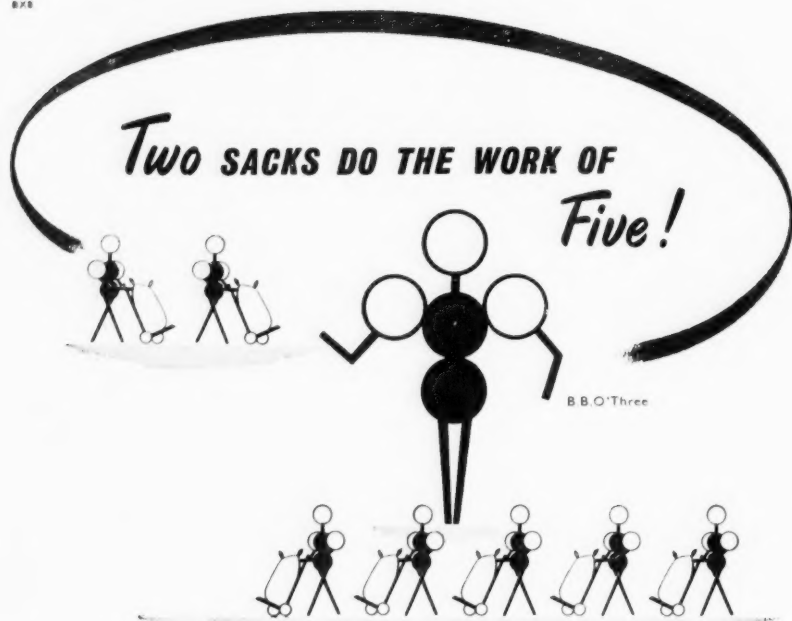
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Ceramics



VOL. V

JUNE, 1953

NO. 52

More Facilities for the North Staffordshire Technical College

"CERAMICS" has stressed the pioneering activities of the North Staffordshire Technical College in the field of technical education for some time now. In this college last year a useful technical training was given to something like 5,500 students. In the ceramics department itself there is both a production and teaching unit which covers the whole range of ceramics technology. In fact, it is about the only really large technical institution specialising in ceramic technology. In spite of the constant demand for encouragement of the export trade in ceramics, the near-sighted government policy of the day caused the anticipated expansion of the College to be postponed. However, one gathers that a new ceramics section will begin to grow quite soon with a grant of £200,000 from the Ministry of Education, and this is indeed a puny sum when reckoned against the important contribution which the North Staffs. Technical College has made for the field of pottery production and dollar earning potential.

Of course, those in the pottery industry so very much concerned with fuel problems, will look forward to the formation of a company to develop the Industrial Fuel Advisory Service promised by the Ministry of Fuel and Power recently.

It is an off-shoot of the Pilkington Committee Report that an independent non-profit-making company should be formed to develop an Industrial Fuel Efficiency Advisory Service, but why the British Productivity Council should appoint a governing body is not quite understood. Nevertheless, half-a-million pounds is to be invested, and it is to be staffed from the Ministry of Fuel and Power, by "persons willing to be transferred" and "other qualified persons who can be obtained." This would make it appear that an important service is beginning its life with second-hand staff, presumably at second-hand rates of pay. One hopes not.

Much is talked at high level about fuel efficiency, but, alas, so little is done.

Wishful Thinking

by ARGUS

THE Australian Prime Minister, Mr. Menzies, speaking recently at a luncheon given in his honour by the North Staffordshire Chamber of Commerce said about British goods: "So long as the goods you produce continue to be as they now are—the best of their kind in the world—then, whatever political people may do about tariffs or quotas or currencies, the world will find some way of coming to your doorstep to buy them from you."

Pottery Exports

Yet one cannot help reading these words spoken by the Australian Prime Minister against the value of pottery exports in April, 1953. It was £1,900,000 compared with £2,700,000 in April, 1952, and £2,500,000 in April, 1951. The value of pottery shipments in the first four months of this year was just over £7 million compared with just short of £11 million in the first four months of last year. The volume of pottery exports in April, 1953 was 420,000 cwt. compared with 584,000 cwt. in April last year. These figures of reality do, to a large extent, discount the statement made by Mr. Menzies. Against this, also, bear in mind that many of these exports include Coronation pottery which is, of course, non-recurrent.

The first six months of the financial year in 1952/1953 might be passable, but the second six months are yet to be faced.

Of course British manufacturers are not helped in the criticism which is voiced by well known figures.

Lady Astor only a year or so ago saw a showcase of pottery on the "Queen Mary" and said it was "appalling." She has complained to the Stoke M.P., Mr. Ellis Smith, about the

quality of British exports and she has accepted an offer made to visit the potteries.

The trouble is that in all such appreciations the subjective personal opinion of a person of high esteem in one walk of life or another does not necessarily reflect the consolidated opinion of all potential buyers of any particular article. The pottery industry has suffered quite a lot in recent years from such personal opinions. Mr. Gordon Russell of the Council of Industrial Design has been a severe critic and not so long ago was suggesting that British pottery should change its design to what he describes as contemporary design.

Another comment from an Englishman who is resident in New York gives support to Lady Astor's criticisms. However, it must be emphasised that much of the china and pottery exported to America is actually made according to designs insisted upon by the American buyers themselves. In fact, one can go through one showroom after another in the potteries and the visitor will see examples of goods being made to a design insisted upon by the overseas market in question, which is not considered attractive by the organisation making the goods.

When the English visitor abroad, used to British traditional design, sees these designs of British pottery made specifically for the particular market he is revolted as indeed he would be if he were in the showroom. On the other hand he would not be revolted if he were the manufacturer receiving the hard currency order, nor indeed will the President of the Board of Trade be revolted.

There is a tendency in this criticism of pottery design for the casual

Note for abstractors. The March and April, 1953, issues of CERAMICS were, in error, both numbered 49, and it would be appreciated if abstractors would note the specific month when making reference to articles appearing in these issues.

critic to fail to comprehend the skill of the manufacturer or give him consideration for the amount of practical knowledge of where his goods will go and what is wanted in the particular market.

Quality/Price Factor

But to return to the Australian Prime Minister's evangelical words and to the April reductions in pottery exports it is obviously necessary that serious cognizance is taken of the reductions.

The pottery operatives are among the eight individual classes of workers out of a total of forty-eight who are recorded as having lost no significant working time due to industrial disputes in 1952. Yet one can hardly agree with Mr. Menzies that quality alone will maintain a market for British goods. Surely it is the quality/price factor which is so very important. After all, quality goods would be appreciated by the vast majority of British and overseas buyers but if this quality is retailed at too high a price then there is bound to be a slackening of demand.

Pottery manufacturers are rightly proud of the vast capital investment they have made in their industry since the war, leading directly to a reduced cost of manufacture. Yet there is indeed still a long way to go.

With certain meritorious exceptions one can wander in and out of a large number of potteries and see the most appalling waste of labour—labour which is now extremely expensive. There is still need for attention to detail, for motion study, for factory planning, for breaking down operations into efficient units, and for the employment of mechanical aids to manufacture and handling of pottery.

Undoubtedly the two most expensive components in pottery manufacture are now labour on the one hand and the cost of fuel on the other. Labour costs are, to some extent, under the control of the management and labour in the sense that they can, even if they don't, come to an agreement with one another, but fuel is completely outside the control of anyone in the pottery industry and its increased prices over the last year or so have done much to force the prices

of goods up and the volume of exports down.

The Federation of British Pottery Manufacturers and the North Staffordshire Chamber of Commerce have battled tremendously hard on this question of fuel costs but it is merely part of the overall picture and successive Ministers of Fuel and Power have all been reluctant to interfere to any drastic extent and institute anything approaching a peg on fuel prices. Thus the increased cost of fuel is passed on maybe a hundred times onto the cost of the finished article. The larger the user of fuel the industry is, like the potteries with its seven-day continuous operation, the more is the effect of high fuel costs felt.

Mr. Menzies may have spoken words of encouragement about tariffs and quotas being unimportant but one would conclude by saying that the British Pottery Manufacturers' Federation have only just been informed unofficially that imports of china and earthenware to Australia are to be restored at once to 100 per cent. Even when he was speaking they were restricted to 70 per cent. to his own country based on the year 1st July, 1950 to 30th June, 1951. Despite their quality, which remained the same, there was a very definite reduction in the value of imports into Australia—due to kind of restrictions which Mr. Menzies discounts as unimportant.

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SALT-GLAZED WARE

(SPECIALLY CONTRIBUTED)

SALT-GLAZED ware comprises that class of ware which is glazed by salt vapour acting on the clay body in the later stages of firing. Such ware was produced in the Rhineland as far back as the twelfth century, and was imported into this country. In 1671, John Dwight of Fulham obtained a patent for having discovered "the misterie of the stoneware vulgarly called Cologne ware." His ware soon established a reputation and was regarded as superior to the German product.

The manufacture of salt-glazed ware was widely carried out in the Staffordshire Potteries from about 1700 onwards, using local clays at first. Soon after 1720 mixtures of the white-burning clays from the South of England and flint were introduced to give white bodies. According to the late Mr. William Burton ("English Earthenware and Stoneware," London 1904), about 60 small factories were making salt-glazed ware in Burslem alone around 1750, and there was a thriving export trade with the Continent and with the Colonies. Many beautiful designs were produced, and these were decorated with enamel colours, so that salt-glazed ware competed with porcelain.

With the introduction of cream-coloured earthenware, which was less expensive to make, salt glazed ware ceased to be made. It had practically been abandoned by 1780. Nowadays salt-glazing is restricted mainly to such ware as pipes and conduits and chemical stoneware.

Raw Materials

The bodies used for stoneware are usually highly plastic clays as distinct from the compound bodies used for earthenware, etc. Stoneware clays are often worked in conjunction with ball clays and mixtures may be used to get the necessary properties. For fine stoneware, such as casseroles, etc., clays burning to a white or light colour are ideal. The clay should be vitreous at 1,200-1,300°C. and its composition

should be within the ratio $\text{Al}_2\text{O}_3 : \text{SiO}_2$ 1 : 3.3 to 1 : 12.6. For large and thick articles it may be necessary to add grog to the body to reduce drying shrinkages with the attendant risk of cracking. For pipes, mixtures of shales or clays are used.

Examples of analyses of stoneware clays are given in Table I.

Shaping of Articles

Stoneware bodies are often highly plastic and the green body has a good strength. For fine stoneware, including chemical ware, the body is often prepared by the usual processes of blunging, lawning, and filter pressing. For pipes and conduits this is an unnecessary refinement, and after grinding and tempering, the clay is shaped by extrusion. Special machines are now available to do this at a high rate. For jars, etc., jolleying is popular and more difficult shapes can be cast. Hand pressing is also used. Large receptacles such as acid eggs and vats are built up by craftsmen who fashion the plastic clay around moulds. Rectangular troughs can be made by pressing out the sides in wooden moulds and then sticking up the parts.

All this is a highly skilled job, particularly as dimensional accuracy is usually required, and great care is required in drying to avoid cracking. The difficulties of moving large pieces before, and after firing, can also be appreciated. Chemical stoneware has to stand up to much more rigorous service conditions

TABLE I
PERCENTAGES

	1	2	3	4
SiO_2 ...	63.36	67.26	71.07	49.17
TiO_2 ...	1.16	1.39	1.81	1.25
Al_2O_3 ...	22.55	19.50	17.40	33.37
Fe_2O_3 ...	1.61	2.25	0.96	1.48
CaO ...	0.22	0.14	0.23	2.00
MgO ...	0.49	0.22	0.16	0.03
K_2O ...	1.70	1.54	1.53	2.13
Na_2O ...	0.23	0.52	0.17	0.93
Loss on ignition	8.27	7.14	7.69	9.42

1 Tyneside fireclay.

2 Burton-on-Trent area stoneware clay.

3 North Devon stoneware clay.

4 Dorset stoneware clay.

than most other types of ceramic ware, and its properties are controlled by specifications.

Salt Glazing

In applying a salt glaze the salt, in the form of coarse commercial material, is thrown on to the fires towards the end of firing. It should be emphasised that all clays will not necessarily take a salt glaze. H. D. Foster (Bull. Amer. Ceram. Soc. **20**, 239, 1941) gives a résumé of technical studies on salt glazing and quotes an extensive bibliography. According to the references quoted, a good salt glaze may be obtained with clay bodies in which the ratio $\text{Al}_2\text{O}_3 : \text{SiO}_2$ varies from 1 : 3.3 to 1 : 12.6 and which become vitreous at temperature, ranging from 1,100°-1,300° C. If the maturing point of the clay is too low, salt glazing may become impossible. Clays too low in silica can be improved by added ground sand.

Salt glazing is usually done in intermittent beehive-type ovens. It is important that the heating shall be as uniform as possible and that the draught shall carry the salt vapour to the insides of the setting, otherwise "starved" glaze will result. The size of the ovens is usually less than 35 ft. diameter.

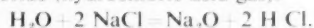
Attempts have been made with varying success to carry out salt glazing in gas-fired tunnel ovens either by drawing in the salt through the burners or by vapourising the salt in pockets built into the oven. Attack of the refractories by molten salt, which condenses and runs down the walls, has been a difficulty. This has been overcome to some extent by using high alumina firebricks and drawing off the salt vapour from the hot zone with a consequent loss of heat. The modern tendency in using tunnel kilns for firing pipes and conduits is to dispense with the salt glaze, and to use instead a slip glaze applied by dipping or spraying on the green clayware.

Salting usually begins about six hours before finishing. The temperature should then be near the maximum and the trials not quite vitreous. It should be noted that if the ware is too porous at this stage the salt vapour passes into the body and a dull matte glaze results. If the ware is too vitreous salting may give a streaky glaze. Where coal is used the fires are allowed to burn bright and then a shovelful of rock salt is thrown in each firehole.

Alternative methods are to blow in the salt with compressed air through, say, an underfeed stoker, or to drop it through the crown of the kiln.

Three to five saltings for each firehole are commonly used and trials are drawn to follow the progress of the salting. A load of about 20 tons of small pipes would require in all about 300 lb. of salt. The salt lowers the temperature of the firemouth considerably, and the fires are allowed to burn bright again before the next salting. The draught is often reduced immediately before salting to prevent the vapour being drawn off too quickly to the stack.

This is not a universal practice, however, and some manufacturers keep the kiln on full draught to pull the vapour down through the insides of pipes which might otherwise be dry inside. The glazing is done by reaction between the vapour and the clay. Water vapour is necessary, since one phase of the reaction is the decomposition of the salt vapour with the formation of hydrogen chloride (hydrochloric acid gas):



The Na_2O then combines with the clay body to form sodium aluminium silicates.

According to H. D. Foster (loc. cit.) the composition of salt glazes varies from $\text{Na}_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 5.5 \text{SiO}_2$ to $\text{Na}_2\text{O} \cdot 0.5 \text{Al}_2\text{O}_3 \cdot 2.8 \text{SiO}_2$, the higher proportions of Na_2O being on the surface or in the thicker parts of the glaze. Normally there is sufficient moisture in the atmosphere to bring about the reaction, but some operators keep water in the ash pits of kilns to be on the safe side. Some use wet salt to add to the fires as an alternative. Additions of borax or of boric acid during the last salting improve the salt glaze and allow salting to be carried out at lower temperatures. An addition of 5-10 per cent. of borax to the last salting enables salting to be carried out at about 100° C. lower. Boric acid is even more effective, but is rather more expensive. An analysis carried out on American plant indicated that the cost of this could be more than recovered by the decrease in losses due to rejects and seconds (H. G. Schurecht and K. T. Wood, Bull. No. 2, Ceramic Expt. Station, New York State College of Ceramics—Alfred University, N.Y., Feb. 1942). Boron compounds result in the formation of complex borates and boro-silicates which tend to be

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more fusible and give smoother glazes.

Effect of the Composition of the Body

Clays after salt glazing vary in colour according to their composition. The effect of iron has been investigated by H. G. Schurecht (J. Amer. Ceram. Soc., 7, 411, 1924), who deduced the following equation:

$$10.3 x_1 - 2.65 x_2 + (14.6 + 54.1 (1.0066) (T - 1110)) x_3 = 100C$$

where x_1 per cent. SiO_2
 x_2 per cent. Al_2O_3
 x_3 per cent. Fe_2O_3
 T temp. °C.

When C lies between 0 and 2 white to tan glazes are obtained, between 2 and 3.5 light brown, between 3.5 and 4.75 brown, between 4.75-8.2 mahogany, and above 8.2 the colour is between dark brown and black. He further stated that high alumina clays gave darker colours than high silica clays for the same Fe_2O_3 content.

For clays high in both lime and silica containing 5.32 per cent. Fe_2O_3 fired at Orton Cone 7 the same author (ibid. 7, 539, 1924) gave an equation

$$-1.00 x_1 + 0.053 x_2 + 2.68 x_4 = 100A$$

where x_1 , x_2 , and x_4 are the percentages of Al_2O_3 , SiO_2 and CaO . When A is greater than zero, greenish-yellow glazes resulted. A clay with too little iron to give a good fired colour can be improved by firing under reducing conditions. Where possible, this is avoided as it sometimes increases the tendency to blistering.

Brightness of Glaze

At low temperatures as little as 1 per cent. of CaO may give a poor salt glaze, and clays high in lime are best salted at higher temperatures. 1.5 per cent. of magnesia improves salt glazing, but in amounts over 3 per cent. a salt-glazed clay goes dull. H. G. Schurecht and K. T. Wood (loc. cit.) state that selecting a clay of lower iron content will often improve the salt glaze of a clay with low silica content. A 1 per cent. reduction in Fe_2O_3 is equivalent to the addition of 7.8 per cent. of SiO_2 to a cone 3 body or of 12.6 per cent. SiO_2 to a cone 7 body (Orton cones), as far as brightness is concerned. 1 to 5 per cent. TiO_2 also improves brilliance.

H. G. Schurecht (loc. cit.) studied the effect of lime between 0.15 and 8.22 per cent. CaO at salt glazing temperatures between O. Cone 02 (approx. 1095° C.)

and Cone 10 (approx. 1260° C.). Commenting that as little as 1 per cent. CaO will prevent bright glazes at low temperatures, he states that such clays are best glazed at temperatures above cone 5, provided the Fe_2O_3 content is low. For lime-bearing clays he stated that the effect could be calculated by the expression:

$$-1.00x_1 + 0.376x_2 - [1.885 + 0.385 (1.01253)^{T-1110}]x_3 - [1.91 + 2.117 (1330 - T)^{0.217}]x_4 = 100G$$

where x_1 , x_2 , x_3 and x_4 are the percentages of Al_2O_3 , SiO_2 , Fe_2O_3 and CaO in the calcined clay and T is the salt-glazing temperature in °C.

When $G > 0$ the glaze is bright, between -0.1337 and 0 it is semi-matte and below -0.1337 it will be matte.

Soluble Salts

More than 0.1 per cent. soluble calcium and magnesium salts in the clay prevent the development of a rich salt glaze and give them dull straw-coloured effects (Schurecht and Wood, op. cit.). This can be prevented by the addition of barium compounds to react with the soluble sulphates. If barium chloride is used sufficient soda ash is added to react with any excess chloride which might cause scumming on its own. Drying as quickly as possible tends to keep soluble material inside the clay where it does no damage to the glazing process. The effect of the addition of boron compounds to the salt in the brightness of the glaze has already been commented on.

Some clays are improved by adding 2 per cent. zinc chloride to the salt. Lithium chloride also produces an improvement (H. G. Schurecht, Bull. Amer. Ceram. Soc., 22, 45, 1943). The use of volatile salts with the salt can be used to make coloured salt-glazed ware, e.g. additions of manganese oxide and cobalt chloride.

Thickness of Glaze

Salt glazes are extremely thin and do not normally craze. They are very resistant to the usual types of effluent and to corrosive liquids.

H. D. Foster (J. Amer. Ceram. Soc., 26, 60, 1943) states that glazes thicker than 0.001 in. are susceptible to crazing. He comments that to get a smooth coating glazes are sometimes three to four times this thickness. Better results are obtained if the thickness is kept down to 0.001 in. and the smooth surface

obtained by a maturing period or by the use of borax in the salting.

Faults

The main faults in salt-glazed ware are dryness of the glaze, roughness, pig skinning and bad colour. The latter affects the sales only, and a pipe otherwise good may not sell well if of a light colour. Most buyers prefer a good rich brown colour.

Dryness arises if the temperature is too low in parts of the kiln or if the salting is done before the ware is nearly vitreous. Frequently it appears on the insides of pipes which have been stuffed with smaller ones and there has been insufficient draught to carry the salt vapour into the insides of the pipes.

Roughness arises when lumps of ironstone and pyrites are found in the clay. These decompose on heating, blowing holes on the surface of the ware. Attention to grinding and sieving will reduce the size of these and additions of borax to the salt will encourage the glaze to flow over them. Fly-ash can also cause roughness, and where forced draught is used, as with mechanical stokers, steps must be taken to prevent blowing fine ash into the kilns when attending to the fires.

Pig skinning is a waviness of the glaze which arises from variations in thickness and can be due to variations in the clay possibly due to bad mixing.

Modern Trends in Firing Stoneware

Some progress has been made abroad in firing pipes and other stoneware articles in continuous tunnel kilns. The difficulties caused by the action of the salt on the refractory brickwork have, however, encouraged the use of alternative types of glaze.

J. O. Everhart (J. Amer. Ceram. Soc., 13, 399, 1930) describes attempts at using a clay slip to which about 30-35 per cent. of salt (reckoned on dry weight of clay) were added. The clay was ground to pass 100 mesh and the salt 65 mesh, and the two were ground together and sprayed on the clay ware. This gave a satisfactory salt glaze. Any clay or shale which will take a salt glaze is suitable and colouring oxides can be added. The mixture may be used as an engobe on clays which will not normally take a salt glaze. Felspathic types of glaze are also used for the same purpose on pipes, and they are widely used on

some types of domestic ware instead of salt glazing.

The use of mechanical stoking in intermittent kilns for salt-glazed ware has increased in recent years. The best system involves building the kiln round and over the underfeed stoker which is located in a pit. These kilns, once the trouble with fly ash was solved, have given very satisfactory results. On one works firing pipes at 1,200° C. the firing period was reduced from 120 to 110 hours and the fuel consumption worked out at 8½ cwt. coal per ton of goods fired—a saving of rather more than 50 per cent. over hand firing.

BIBLIOGRAPHY

- W. Burton, *English Earthenware and Stoneware*, London, 1904.
 J. O. Everhart, *T. Amer. Ceram. Soc.*, 13, 399, 1930.
 H. D. Foster, *ibid.*, 26, 60, 1943.
 R. K. Hursh, *ibid.*, 14, 482, 1931.
 H. G. Schurecht, *ibid.*, 7, 539, 1924; 1, 411, 1924.
 H. G. Schurecht, *Bull. Amer. Ceram. Soc.*, 22, 45, 1943.
 H. D. Foster, *ibid.*, 20, 239, 1941.
 N. D. Wood, *Trans. Brit. Ceram. Soc.*, 34, 269, 1935.
 Anon. *Brick. Clay Rec.*, 98, No. 2, 17, 1941.
 H. G. Schurecht and K. T. Wood, *Bull. No. 2, Ceram. Expt. Stat.*, New York State Coll. Ceramics, Feb., 1942.

CORONATION WARE

DEMAND for Coronation souvenir pottery has been well up to expectations, and the big trade done by many manufacturers has been of great help to the industry.

The number of souvenir pieces sold cannot yet be assessed, but it must number many millions.

While, of course, most of the ware has gone to the home market and the British Commonwealth, there has been a surprising demand from other countries. One firm mentions a particular interest in Scandinavia and Italy.

An official of the British Pottery Manufacturers' Federation states: The Coronation souvenir trade has been very good. It has certainly been a considerable help to pottery manufacturers. The orders have been well up to expectations.

A famous firm, who produced a limited edition of 1,000 prestige pieces, report that these could have been sold several times over. In fact, the huge demand had proved embarrassing.

(*Evening Sentinel*.)

The Production of "Fibreglass" Rigid Sections

A New Continuous Plant

EFFICIENCY in the manufacture and production of rigid section insulation has been substantially stepped up by a continuous semi-automatic process now in production line use at the works of Fibreglass Ltd., St. Helens. The process provides a marked time saving as well as setting a new quality control standard compared with the practice previously used, and this plant is undoubtedly one of the finest installations of its kind in the world.

"Fibreglass" rigid sections are used for the insulation of hot-and-cold water pipes and steam pipes. They are moulded from glass wool bonded to a density of 10 lb. per c. ft., and have an outer cover of canvas or scrim cloth. The sections are 3 ft. long and are manufactured in the following sizes.

- (a) $\frac{1}{2}$ in. thick to fit all pipe sizes from $\frac{1}{2}$ in. to 4 in. bore inclusive.

- (b) $\frac{1}{2}$ in. to 2 in. thick, in $\frac{1}{4}$ in. increments, to fit all pipe sizes from $\frac{1}{2}$ in. to 12 in. bore inclusive.

The moulded sections are split in half longitudinally, the outer covering acting as a hinge. Canvas covered sections have overlaps at one end, as well as along the longitudinal edge, to ensure a neat and efficient finish when they are applied to the pipe. They can be supplied with a waterproofing treatment applied to the canvas cover—applied to railway carriage heating pipes—metal retaining bands are also available.

Being made entirely of glass, the sections are chemically inactive, non-hygroscopic, rot-proof and offer no sustenance to vermin.

All these properties are very desirable in any insulating material, but besides these, "Fibreglass" rigid sections have two fundamental advantages

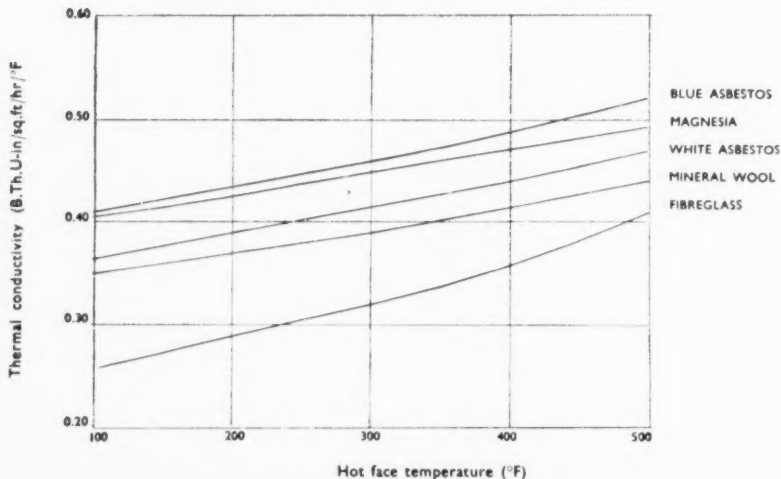


Fig. 1. Graph showing thermal conductivity

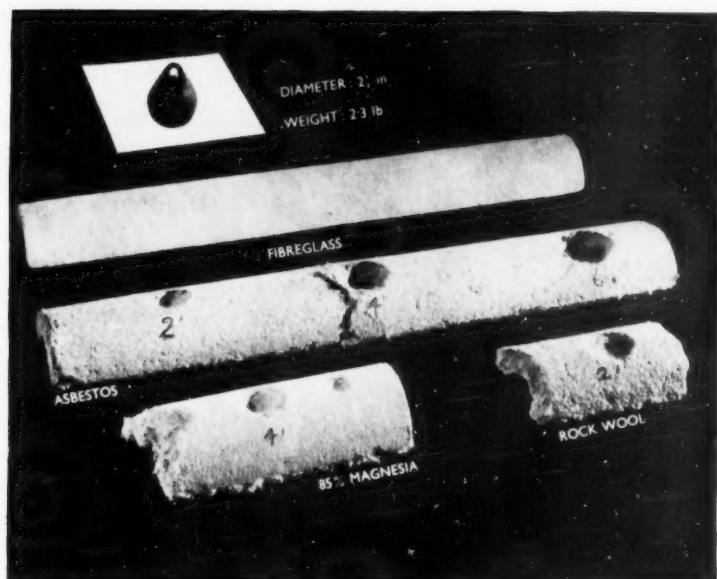


Fig. 2. Result of impact test

over most other sectional insulating materials. They have extremely low thermal conductivity values and although they are light in weight, they are strong and well suited to the rough handling they are likely to receive on site. The graph Fig. 1, shows the thermal conductivities of five sectional insulation materials at various hot face temperatures (cold face temperatures 100° F.), and the photograph Fig. 2 clearly shows the results of impact tests on the same materials. The weight used in the test was dropped from heights of 2 ft., 4 ft. and 6 ft. on to the sections. Only the "Fibreglass" section was undamaged.

Sections of competitive insulating materials cost much the same as "Fibreglass" sections of equal dimensions; therefore, for a given expenditure on insulation more heat will be saved when "Fibreglass" is used. Alternatively, for a given heat loss, thinner sections may be used.

"Fibreglass" rigid sections are not affected by pipe vibration; they are virtually indestructible, easily removed for inspection and suitable for re-use.

The manufacturing process begins when the mat of white wool seen in

Fig. 3 is cut into lengths depending on the required bore, and wall thickness of the finished product. These lengths of wool, made entirely of glass are then rolled on to waxed mandrels to B.S.S. pipe bore specification, and sprayed with a binding agent and formed under pressure into sections of a determined density, bore and wall thickness.

At this stage, the wet sections are racked on the tiers of bogies (Fig. 4) which will take them on their 110 ft. journey through the drying oven where the moisture is evaporated.

The drying oven, Fig. 5, has been designed and manufactured by Controlled Heat and Air Ltd., of Smethwick, Birmingham, and is of the continuous tunnel type, divided into four sections in each of which is maintained automatically graduated conditions of temperature exactly suited to the stage and period of drying.

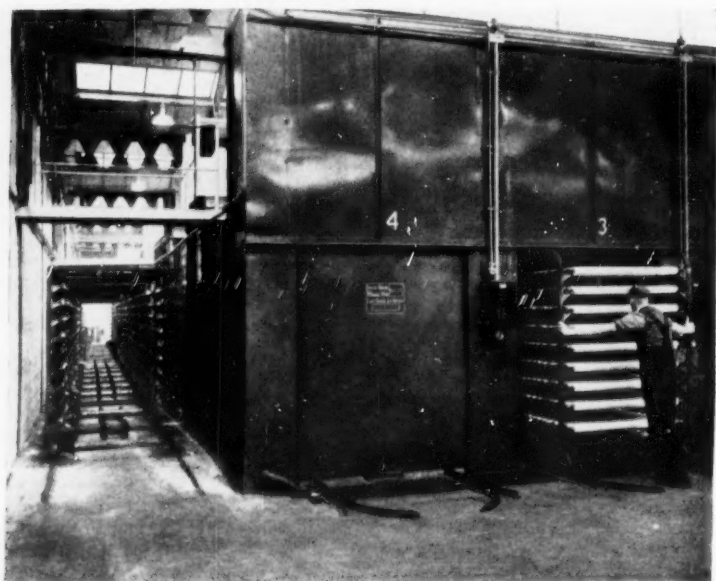
Each section is complete with three separate heating systems, arranged for direct gas firing, each system operating under close thermostatic control and incorporating electronic safety devices which shut down on flame

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Fig. 3 This mat of white wool is cut into lengths depending on the required bore, and wall thickness of the finished product

Fig. 4. After being rolled on to waxed mandrels and sprayed with a binding agent, sections are racked on the tiers of bogies and passed through the drying oven



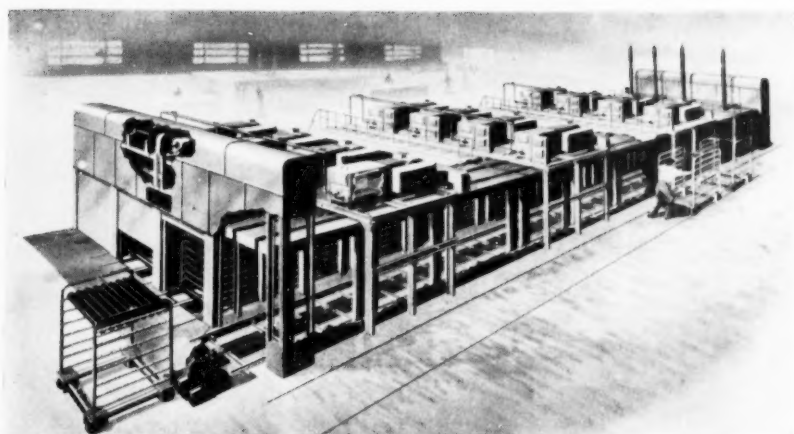


Fig. 5. An artists impression of the oven, designed and manufactured by Controlled Heat and Air Ltd.

failure, fan failure or electrical failure.

The oven casing, is of double-cased construction and is filled with "Fibreglass" resin bonded slabs of $4\frac{1}{2}$ lb. density. The heater casings are insulated in a similar manner but with slabs of 8 lb./c. ft. density.

The external ducting and circulating fans are completely covered with "Fibreglass" resin bonded slabs finished with $\frac{1}{2}$ in. thickness of hard setting compound.

As mentioned above, each tunnel is graduated in temperature and humidity and the air flow is contra to the flow of work so that the wet sections when placed in the feed end of the oven are processed in air having a high relative humidity, which speeds up the heating process because of its greater total heat, as compared with dry air.

One of the most important considerations in any moisture removal problem is, that the physical structure, density and porosity of the material determine the rate at which the moisture can be removed from it. The water must be caused to travel through the mass from the interior to the surface where it can be quickly evaporated by means of correctly conditioned air properly circulated over the surfaces.

It is obvious that even if drying equipment is carefully designed along scientific principles with adequate

apparatus for indicating humidity, wet and dry bulb temperatures etc., efficient results cannot be obtained unless the conditioned air is effectively applied to the material.

Effective application of this air demands a strong vigorous circulation uniform in all parts of the drying tunnel, in fact the whole process depends on the vital factor—rapid circulation.

In each heated section of the tunnel, 10,000 c. ft. of air per min. is in circulation, a total of 30,000 c. ft. per min. in each tunnel.

Specially designed ducting directs the conditioned air over and around the sections as they lie on the bogies, the air then being picked up by the re-circulating ducting situated at the top of the tunnel. The system is so adjusted that a predetermined air volume is always moving forward contra-flow to the work gathering more moisture on its travel and after doing its part of heating up the cold work at the loading end is extracted and discharged to atmosphere.

The bogies are guided on their journey through the tunnels by well designed drag line conveyors, the conveyors being suitably interlocked with the automatically operated counter-balanced doors so as to be fool-proof. The drying cycle takes between twenty and forty-two hours depending on the size and wall thickness of the sections. The ovens are capable of

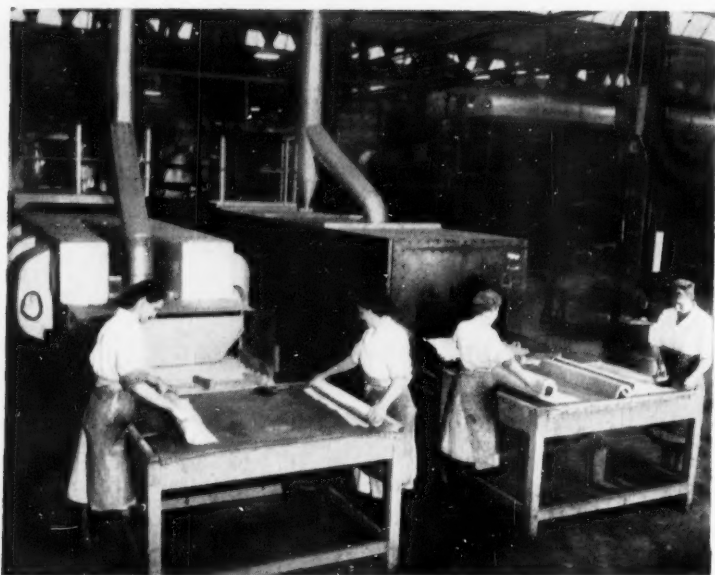


Fig. 6. The low-temperature ovens used for the final drying process

removing one ton of moisture per hour, the actual gas consumption of each tunnel being in the region of 1,930 c. ft. per hour and representing a thermal efficiency of 45 per cent.

When the sections emerge dry from the oven, they are stripped from the mandrels, trimmed to 3 ft. in length, split axially and covered with either calico or scrim cloth.

When the covering has been pasted on overlapping along the longitudinal length and at one end, the rigid sections are placed on conveyors, Fig. 6, having specially designed chains to accept the cylinders which carry them through low temperature ovens for a further drying process.

These ovens, which have been designed and manufactured by Controlled Heat and Air Ltd., are heated by air circulation, and arranged for direct gas firing. Thermostatic controls and full safety devices are incorporated, and the variable speed gears on the Unit cater for drying times of seven min. to thirty min.

These oven casings also are of double-cased construction and are insulated with "Fibreglass" resin bonded slabs and the heater, circulating fan

and ducting are insulated in a similar manner, as explained above.

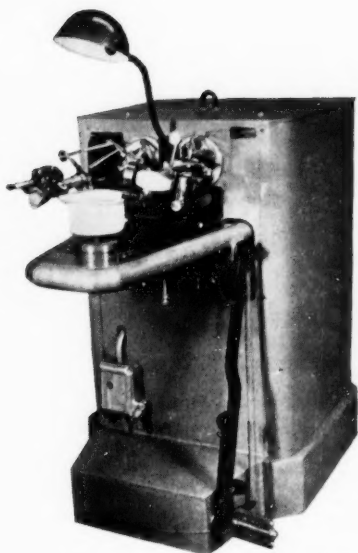
When the sections emerge dry, the edge with the overlap is opened, the section thereby becoming hinged for ease of application.

The finished sections are then inspected for quality, correct bore and wall thickness, before they are packed and despatched.

POTTERY EXPORTS

THE value of pottery shipments in May was £1 732,726, compared with £2,305,342 in May last year, and £2,122,749 in May, 1951. This brings the total value of pottery exports in the first five months of this year to £8,741,590, compared with £13,228,723 in the corresponding period of a year ago, and £10,407,742 in the first five months of 1951.

The volume of pottery exports in May was 411,851 cwt., compared with 519,199 cwt. in May last year, and 596,402 cwt. in May, 1951. The volume of pottery exports for the year to date is 2,017,181 cwt., compared with 2,813,542 cwt. in the first five months of last year, and 2,501,216 cwt. in the first five months of 1951.



GOLD EDGE LINES

THE "RYCKMAN" GOLD EDGE LINING MACHINE PRODUCES GOLD EDGE LINE OR STIPPLE ON CUPS, SAUCERS, PLATES, ETC. UNSKILLED FEMALE LABOUR MORE THAN DOUBLES THE USUAL OUTPUT WITH SUPERIOR RESULTS AND A CONSIDERABLE ECONOMY IN GOLD CONSUMPTION.

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SWEDISH LIGHT-WEIGHT BUILDING MATERIALS

To be Manufactured in North America

SIPOREX, the Swedish light-weight building material made from cement, siliceous sand, alumina and certain chemicals, which in recent years has helped to rationalise building technique in Sweden and other countries is, at present, being introduced into the Western Hemisphere.

According to press reports, Internationella Siporex AB, of Stockholm, the patent holders, have signed licence agreements with firms in the United States, Canada and Mexico.

The United States Plywood Corporation has obtained the exclusive rights to manufacture this multi-purpose building material in the United States under the market name of Zeprex. In order to accelerate production, U.S. Plywood Corporation has acquired the business and assets of National Brick Corporation, Long Island City, N.Y., the largest manufacturer of sand-lime bricks in the United States and also one of the major producers of concrete masonry units. U.S. Plywood will establish further Zeprex plants throughout the country after the initial factory is in operation.

In Canada the big industrial group

Dominion Tar and Chemical Company (DTC), of Montreal, has obtained the licence for the manufacture of Siporex throughout the dominion and several factories are being planned for its production.

Investigations in Mexico in the past few years have also shown that the possibilities for taking up production of Siporex are very good. A few weeks ago some financial groups founded a company called Siporex de Mexico S.A. for the introduction of this building material.

Being as weatherproof as stone, Siporex is lighter than wood and can be sawn, hewn, nailed and bored. Its good insulating properties make it suitable for all climates, and it is already used from the Equator to the edge of the Arctic Circle.

Prizes amounting to £2,250 are offered in this year's Industrial Art Bursaries competition. The prizes are available as travelling bursaries valued at £150 each and are open to students intending to take up industrial designing as a career. The closing date is 12th October, 1953. Details of the awards and conditions of candidature with full supplementary information are contained in the 1952 report, available from the Royal Society of Arts, John Adam Street, Adelphi, London, W.C.1.

MANUFACTURE OF GAS FIRE RADIANTS

THE manufacture of refractory radiants for gas fires is being carried out as a continuous process at a Production Centre of Radiation Ltd.

The raw materials consisting of specially selected clays and other ingredients are first thoroughly dry-mixed, water then being added to impart the necessary plasticity to the mass. Mechanical mixing tends to trap a certain amount of air in the mixture, which if allowed to remain, would lower the strength of the finished product. The plastic clay mass is therefore shredded and passed through a vacuum chamber which removes the air and is then extruded in the form of rods, round in section. These "wads" are of a form and size suited to the next process of moulding the radiants.

The clay wads are passed forward to the moulding section where they are forced into shape on the latest type quick-acting hydraulic presses, each of which is controlled to give an exact pressure. The mould, in which the clay

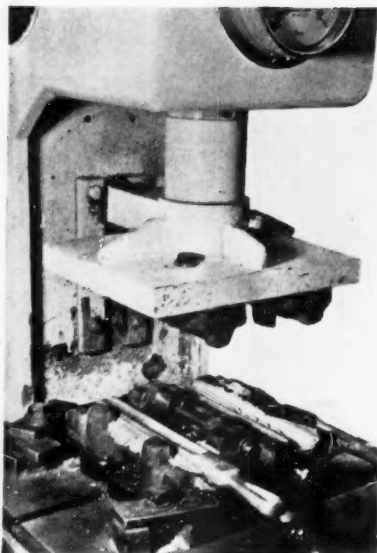


Fig. 1. Hydraulic press for shaping the radiants

is pressed, is in two halves (Fig. 1), and after the two sections of the radiant



Fig. 2. The mould is removed from the press with specially designed lifters



Fig. 3. A slow moving conveyor takes the trays of radiants to the drying tunnels

have been formed they are folded over, and securely joined, before being removed from the mould with specially designed lifters (Fig. 2). At the side of

each operative is a tray, shaped to receive the radiants as removed from the mould, and when filled it is placed on the slow-moving conveyor (Fig. 3)

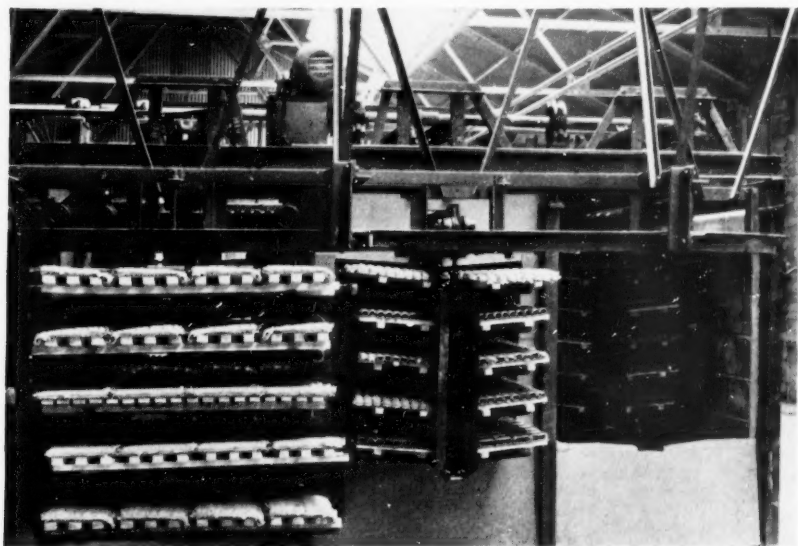


Fig. 4. The trays of radiants are racked for passage through the tunnels



Fig. 5. Following inspection, sound radiants are ground to size

which takes the plastic radiants to the drying tunnels. Here careful handling is particularly necessary because the radiant in its soft condition can be easily damaged. The trays of "green" radiants, as they are called before burning, are carefully transferred on to rack cars (Fig. 4) which move slowly through the drying tunnels where the moisture is removed evenly and under controlled conditions.

At this stage the radiant though not pliable is still fragile, and the excess material left by the moulding process is carefully removed from the edges and the openings in the radiant pattern by operatives "fettling" or cleaning each opening individually.

The next operation, after the fettled radiants have been put into "saggars" which are refractory containers, is the "burning." Here the saggars of radiants are passed slowly through a tunnel kiln having graduated and controlled temperatures, even to the cooking time after "burning." Radiants come from the kiln white in colour, having the mechanical and refractory strength necessary in a high grade radiant and pass to the inspection and gauging department.

Each radiant is then examined for flaws, the perfectly sound ones being ground to size (Fig. 5) and gauged to narrow limits. The final stage is packing, each radiant being individually cased in a corrugated sleeve before packing in bulk.

The closest attention is paid to all process detail, and the whole of the manufacture from the clay mass to the finished product is under laboratory control to ensure that radiants of a consistently high quality are produced.

Smoke Abatement.—The National Smoke Abatement Society Year Book for 1953 is available from the Society at Chandos House, Buckingham Gate, London, S.W.1. price 1s. It provides information on the Society, its activities, the legal aspects of smoke, the measurement of pollution and a summary of information covering all aspects of smoke abatement.

Fuel Efficiency.—The Rt. Hon. Earl of Derby, M.C., Lord Lieutenant of Lancashire, will open the Fuel Efficiency in Industry and Home Exhibition to be held at the City Hall, Deansgate, Manchester, on 18th November, 1953. The exhibition is held under the auspices of the Combustion Engineering Association.

For DUCTING- —AND VENTILATION EQUIPMENT

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INSTITUTE OF VITREOUS ENAMELLERS

WHEN the Institute of Vitreous Enamellers held their spring conference at Buxton recently, members of the British Ceramic Society and the Society of Glass Technology were invited to take part in a series of technical sessions and works visits.

The event opened with a reception and dance given by the Mayor and Mayoress of Buxton, the Duke and Duchess of Devonshire. Technical sessions were held on two mornings and a variety of works visits were organised in the afternoons.

A day tour of Derbyshire was arranged for wives and the President's reception was held in the evening. The conference ended with a banquet.

The inaugural lecture was given by Professor R. J. Sargant, O.B.E., on "Fuel and Economics," a subject of fundamental significance to all three industries. Then three sessions were held simultaneously, Professor H. Moore dealing with "Strains in Vitreous Enamels," Dr. J. H. Partridge and Mr. T. S. Busby with "Mullite and Zircon Tank Blocks," and Dr. D. G. Beech and Mr. D. A. Holdridge with "Some Aspects of Testing of Clays for the Pottery Industry."

The conference adjourned and parties travelled by coach to visit one of the following works: Simplex Electric Co. Ltd., Blythe Bridge; Mintons Ltd., Stoke; Josiah Wedgwood and Sons Ltd., Barlaston; W. T. Copeland and Sons Ltd., Stoke; or the Derbyshire Silica Firebrick Co. Ltd., Hartington.

On the last day, a lecture by Mr. M. W. Thring, entitled "The Study of Flame Radiation," was followed by simultaneous papers by Mr. J. Bain on "Mechanical Handling," and Dr. B. P. Dudding, M.B.E., on "Presentation of Data as Aids to Production Efficiency."

Shell M.E.K. Prices Down.—Another price reduction on one of their solvents, this time methyl ethyl ketone, effective on all deliveries made after 1st April, has been made by Shell Chemicals Ltd.

The reduction in this case is by £10 per ton, so that the new price per ton at the 10-ton rate is £141, equivalent to a cost per gallon of 10s. 1½d.

(Continued from CERAMICS, April, 1953.)

Manufacture of Domestic Pottery in China and Earthenware Clays

The use of Towns Gas

by

K. DAVIES

TAKING typical time temperature curves on china and earthenware biscuit tunnels (two firing domestic pottery and one firing wall tiles) the time shown for firing wall tiles is 88 hr. 48 min., while the time taken to reach peak temperature of $1,120^{\circ}\text{C}$. is 53 hr. This lengthy time is due to the extremely dense load of tiles on the trucks and the necessity for the heat to penetrate the whole mass of clay evenly and gently so as to remove moisture at a steady rate and avoid split and deformed tiles.

The earthenware biscuit pottery curve gives a time cycle of 66 hr., while the china biscuit gives a time of 60 hr.

However, the time taken to reach peak temperature of just over $1,100^{\circ}\text{C}$. in the case of earthenware is very much longer than that required for the bone china body to be brought up to over $1,200^{\circ}\text{C}$.

Bone china can be fired much more quickly as it does not contain so much water owing to the absence of ball

clay. With the bone china body, however, a comparatively long period is taken to bring the last few degrees in temperature, as the final temperature is so critical with this lean body. A few degrees overfired would cause the ware to collapse.

Fig. 11 shows a tunnel and dryer combined for firing wall tiles. The length is 252 ft. 9 in. and the firing tunnel is open fired. The burners are Amal type natural draught and are divided into five groups. There are ninety-two burners and the three groups of burners (sixty in all) situated in the actual firing zone are automatically controlled from thermocouples in the furnace arch, operating motorised valves on each group. Pre-heating burner groups are manually controlled either individually or by group valves. Three recirculating fans are installed in the pre-heat end of the tunnel and contra convection fans are fixed at entrance and exit. Pre-heated secondary air is supplied to the

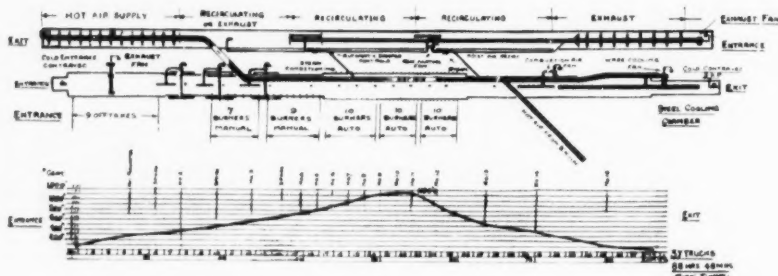


Fig. 11

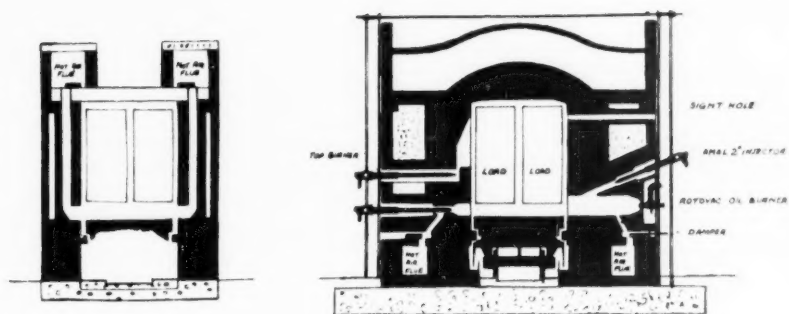


Fig. 12

burners from a fan in the intermediate cooling zone. This air is pre-heated in cooling the ware and is blown through ducts on each side of the tunnel under the burner positions. Air to each burner is supplied through a damper from this duct. The ware cooling fan takes out pure hot air from the tunnel and supplies this into a duct for discharge into the exit end of the tunnel dryer. This air is also supplemented by air from a ware cooling fan on kiln B, and as previously explained, this hot, dry air travels through the dryer in a counter flow to the passage of tiles and increases in humidity as it picks up moisture from the tiles entering the dryer. Recirculation fans give complete control of conditions inside the dryer, and in addition steam conditioning is incorporated to allow humidity to be increased if required. Humidity in the dryer is automatically controlled by Negretti and Zambra Hygrostats operating on compressed air, and actuated by elements fitted in the dryer and comprising of a collection of human hairs which elongate and contract with moisture variation. This movement operates a compressed air leak valve which varies the air pressure in a control line to a steam valve and fresh hot air damper, thus positioning them according to the humidity conditions required in the dryer. Steam is automatically introduced when humidity falls and the flow of fresh hot air is increased as humidity rises. The multiport exhaust system allows saturated air to be drawn off at a

wide range of points along the dryer.

The tunnel is also fitted with oil burners so that it can be transferred to oil firing should necessity arise.

Fig. 12 shows a section through the tunnel and dryer, and the hot secondary air supply to the tunnel burners, can be seen together with the position of the oil burners. The section of the dryer shows the hot air ducts and dampers controlling the quantity of air delivered at the bottom of the section.

The product of the length and cross sectional area of a tunnel is, of course, directly proportional to the output required for a given time/temperature curve, and for economical reasons in the earlier history of tunnel ovens this was interpreted in a wide cross sectioned tunnel of short length. This, however, had serious faults, most particularly in control of temperature across the setting as temperatures in the region of the centre bottom of the load tended to lag behind the rest of the setting.

The short length of tunnel resulted in very slow speeds of ware through the tunnel with virtually no control over the rise in temperature of the ware during pre-heating, nor to the rate of cooling. From a fuel efficiency point of view, serious loss of heat occurred through the exhaust as the incoming ware had no time to effectively utilise the full value of the heat in the products before they were exhausted. Modern trend in tunnel design is, therefore, to reduce the cross sectional width to a more controllable point and to lengthen the tunnel so

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as to give more control over the pre-heating and cooling temperatures. Increase in insulation of tunnel walls more than compensates for the increase in heat loss through the longer tunnel walls, as the length increase is in the pre-heating and cooling zones where the temperatures are comparatively low. Much more effective heat exchange is obtained, however, between ware and products of combustion leaving the firing zone and control over rise in temperature of the ware is simplified.

A more careful study of combustion conditions in the tunnel, and the introduction of modern types of burner includes the C.C. burner, medium pressure burners, gas/air mixing plant, and the use of pre-heated air to speed combustion within the burner block are giving marked results in fuel saving in the tunnel oven, while the increasing utilisation of the waste heat for drying and space heating is reducing the amount of fuel used for steam raising and direct gas heating on ancillary processes.

The introduction of lighter car furniture and the expanding use of direct firing without either saggars or muffle promises further reduction in the therms per ton of ware fired in the future.

After biscuit firing which turns the clay body into a hard brittle porous article it may be required to apply underglaze decoration before the ware is glazed.

Underglaze decoration has the advantage that it is completely covered and protected by the glaze and is, therefore, impervious to wear and tear to which it may be subjected in the home. The colours used for decoration are metallic oxide pigments mixed in oils and gum, and earthenware biscuit is so porous that these soak into the body, and would prevent glaze from adhering to the surface if they were glaze dipped at this stage. The ware is, therefore, passed through a hardening-on tunnel which raises the ware to a temperature of approximately 600°C. This burns off the oils and fats and leaves a matt surface ready for the application of glaze. China biscuit being almost non-porous does not require this firing.

Glaze gives a glassy coating to the ware. It is made from a mixture of materials, the principal ones of which are borax, lead bisilicate, china clay, flint, cornish stone, whiting, and soda ash. Some of these materials are soluble in water and, therefore, have to be made water insoluble by vitrification into frit. Frit firing is

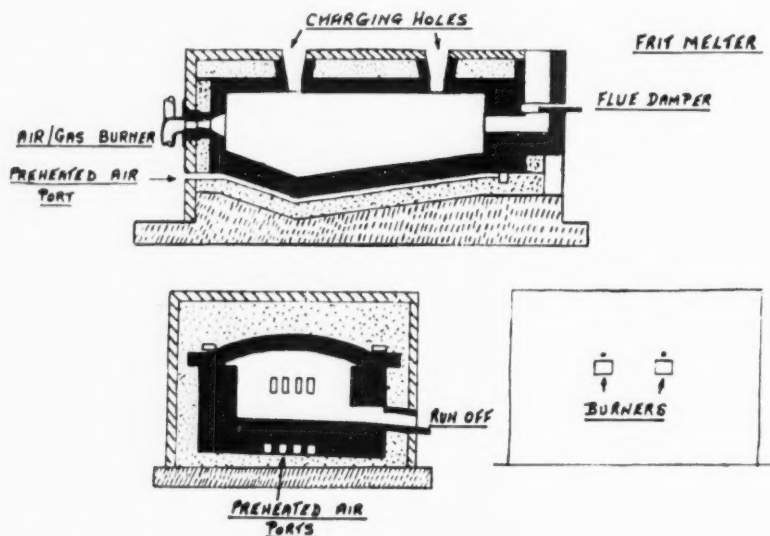


Fig. 13

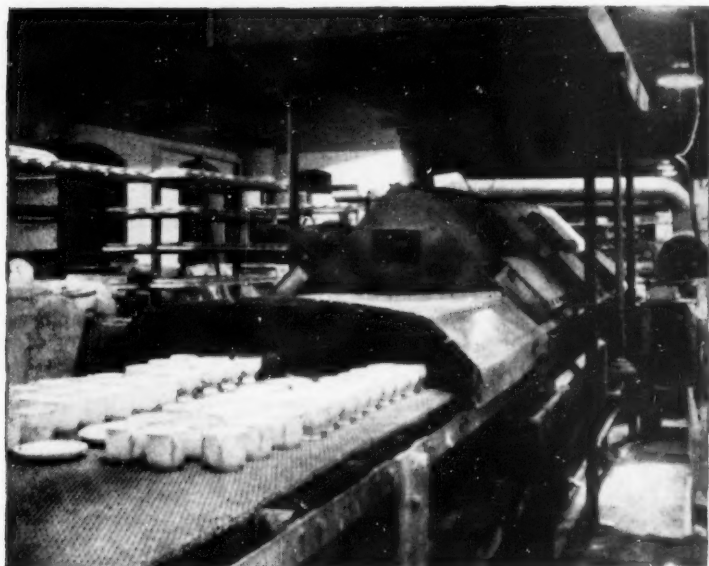


Fig. 14

carried out in gas-fired furnaces using air blast burners. Fritting temperatures may be as high as 1,350° C. to 1,400° C. and to obtain this temperature quickly and efficiently, pre-heated air is supplied to the burner by passing this combustion air through ducts running under the floor or along the sidewalls of the furnace. Fig. 13 shows a typical gas-fired furnace for frit melting and using two Eddy Ray burners. Figures of output are as follows:

Weight of charge on 900 lb.

Weight of charge off 640 lb.

Firing time 3 hr. 15 min.

Gas consumption per charge 32 therms.

Giving a figure of 20 lb. of frit off per therm.

This furnace will normally run continuously 24 hr. per day for ten weeks or more before furnace repairs are required. Originally when the furnace was coal fired 6 cwt. of coal were required per charge giving a figure of 91 therms per charge or 2.8 times the heat requirements on town gas, and the furnace had to be let down every week-end for repairs.

Frit is very susceptible to atmos-

phere and reducing conditions in the furnace result in a brown discoloured product which would cause variation in glaze quality. Brown charges were very common when coal fired, but never occur in gas firing, owing to the complete control obtained. Identical charges over a whole ten weeks fritting period are obtained, and the saving in labour, furnace repairs and fuel, bring the cost per charge on town gas well below those obtained on coal.

The vitrified frit is mixed with the other ingredients contained in glaze and these are ground in water to form glaze slip.

The biscuit ware is dipped into the glaze slip and then dried to leave a dry coating of glaze powder adhering to the ware.

Glaze drying is carried out very successfully by infra-red panels although various other types of dryers are in use using hot air recirculation from gas-fired air-heaters.

Fig. 14 shows an infra-red dryer comprising of low temperature panels. The ware is dipped into the glaze slip and placed on the endless belt. The dryer is 12 ft. in length and

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the time through the dryer is 15 min. 1,128 pieces per hour pass through the dryer and the gas consumption averages 280 c. ft. per hr., giving just over four pieces of ware dried per c. ft. of town's gas. Large numbers of this type of dryer are in use in the potteries at the present time and many further installations will be put in when further supplies of town's gas are available.

After receiving a coating of glaze powder, the ware now passes to the glost oven, where the glaze is melted to a glassy finish at a temperature ranging between 1,040° C. and 1,150° C. In glost firing the ware must be kept separated or the articles would stick together into a solid mass. The ware may be placed in saggars and each piece separated from another by means of refractory thimbles, spurs, stilts, etc., or it may be placed open on cars and separated by special refractory supports.

Glaze firing requires a different technique to that of bisque firing. The atmosphere around the ware must be oxidising and must be as still as possible. At the same time, volatile gases given off by the glaze must be carried away. A turbulent atmosphere in a glost oven would carry away part of the glaze coating giving the glazed ware a starved appearance and robbing it of the brilliant glossy shine characteristic of good pottery. Also dust particles would be blown about by the turbu-

ence and deposited upon the tacky surface of the molten glaze causing spoilage. For these reasons a number of tunnels in the Potteries, firing glazed ware are "muffled" or alternatively the ware is placed in saggars, and the tunnel open fired. This, of course, results in a higher consumption of town's gas per pound of ware fired, and nowadays more and more firms are turning to complete open placing of ware in open-fired tunnels. The burner equipment on these open-fired glost tunnels is mostly natural-draught and a soft semi-luminous flame is employed to give a minimum of velocity of products and high radiation of heat from the flame. Muffle type tunnels employ air blast burners using pre-heated air from the cooling end of the tunnel, and Fig. 15 shows a section through a "radiant tube" muffle tunnel built by the British Ceramic Service Co. This tunnel is fired from the top into the radiant tubes which pass along the sides of the tunnel to the exhaust fan fixed at the entrance end. Automatic control is fitted to the burner equipment and the temperature of each tube can be regulated separately. The length of travel of heat along the tube is controlled by lengthening or shortening the flame to suit. No products of combustion enter the tunnel proper and heating is by direct radiation from the tubes.

Fig. 16 shows a Gibbons Bros.

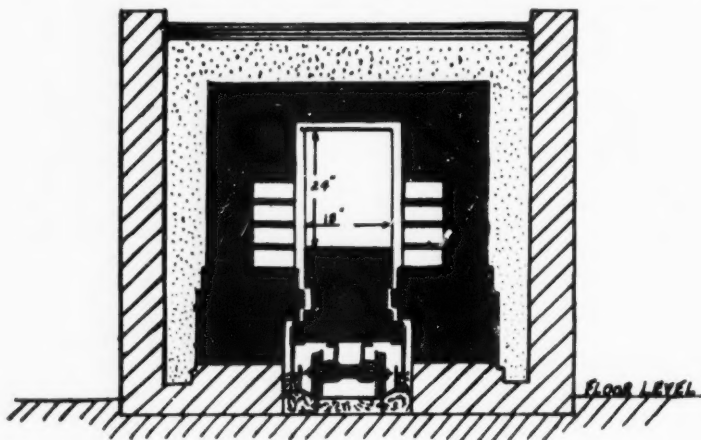


Fig. 15

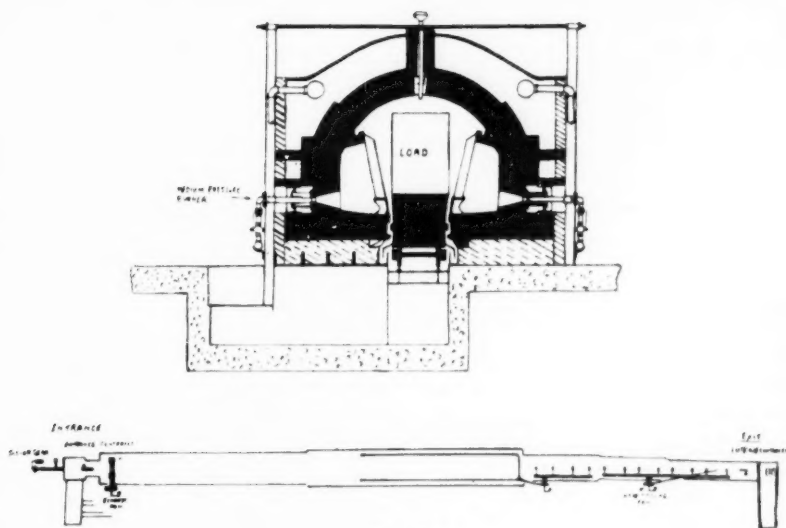


Fig. 16

muffle type tunnel for firing glazed ware. The chambers on each side of the tunnel are heated by air blast burners supplied with pre-heated air from the cooling zone. It will be observed that the burner positions and, therefore, the centre of combustion is at the bottom of the chamber and that the inner chamber wall is sloped away from the ware at the top. This prevents the top of the load from overheating while the bottom is coming up to temperature. A double wall of thin refractory on the face of the chamber creates a hot flue and convection currents are formed by this means. Air is heated in the flue by conduction through the chamber wall and this air discharges at the top of the setting being replaced by cooler air entering the flue at the base. The chamber is heated by a number of burners positioned in the firing zone, and the exhaust fan pulls the hot products along the chamber to the entrance end of the tunnel. The incoming ware is indirectly pre-heated by convection currents set up by the hot face of the muffle as the load passes towards the firing zone. Cooling of the load is also carried out indirectly by passing cooling air through cavity walls and false arch at the exit end of the tunnel. The

following figures were taken on a tunnel firing glazed earthenware pottery. The tunnel is a muffle type and the load is open placed on the cars.

Length of tunnel—210 ft.

Weight of ware fired per week—94,250 lb., equivalent to 172,600 pieces of mixed ware per week.

Gas consumption per week 4,165 therms, giving figures of 22.63 lb. of ware per therm, or 41.25 pieces of ware per therm.

(To be continued.)

FROM THE U.S.A. PRESS

Barium Peroxide in Nickel Bath for Enamel Ware Conserves Nickel Salts

Three American enamel plants have taken advantage of the benefits derived from the use of barium peroxide to control a nickel bath, a process recently developed by chemists of the Chicago Vitreous Enamel Product Co., Chicago, Illinois. Because barium peroxide controls such nickel bath factors as pH and ferrous sulphate content and eliminates the formation of sodium sulphate, tank life can be considerably prolonged and the consumption of nickel salts reduced.

GLASS-MAKING RAW MATERIALS IN RUSSIA

Conference Discusses Improvements

TRANSLATED BY W. G. CASS

SOME of the papers presented at the Russian conference on batch quality towards the end of last year (*Steklo i Keram.* 1952, 9 (11), 22-23) have been reported in full, and condensed versions are incorporated herein. The authors are among the leading directors and engineers in the glass industry that attended the meeting. Methods of storing, transport, refining, mixing, were reviewed, and various suggestions made for improvement.

A. P. Patenko, chief engineer of the Glavstroesteklo (Bldg. Glass Bd.), referred to the increased production of constructional glass, though much of it was below the required standard, especially sheet and window glass. The best practice of the leading factories—several named—should be more generally followed, e.g. in the refining of the Aral sulphates (Na), automatic mixing, and transport. More attention must be given to storage.

Rimkevich, of the Glass Raw Materials Trust, described the work of the Trust since the last technical conference (May 1951), especially in the matter of reducing iron oxide in sand and dolomite, increasing basic content in sulphates, and generally improving mining and quarrying methods. New sources of sodium sulphate are being developed, and the work of the Aral Sulphate Combine extended. (Presumably this refers among others to the Aral-Sor salt lake, 170 miles north of Astrakhan.)

I. B. Shlain, of the Glass Research Inst., also described work on iron oxide, and on sulphate refining. For high alumina clays he suggested more extensive use of the products of the Prosyantovski Kaolin Combine. He reminded the meeting that under the current Five-year Plan a fourfold increase in the production of polished glass is contemplated, but of improved

quality; in which a first essential is better raw material, attainable by seeking and developing new high-grade deposits, using better mining methods, more efficient refining, etc. Important development and improvement works were undertaken in sand, dolomite and sulphate quarrying, in the Kharkov and other districts; and at the Glass Research Inst. sand testing and refining were carefully studied. Large refining plant was installed in the Gorki and Proletar factories. But much more yet remains to be done in these and other directions, and especially in regard to iron oxide. This averages at present 0.12 per cent. in the raw material, reduced in many works to 0.09 per cent. or less, with corresponding improvement in the transparency of the glass.

The various refining methods were discussed: washing, flotation-abrading, and electro-magnetic separation. Tests with the electrostatic method do not appear to have been very satisfactory, although a long paper by Shlain on the subject has since been published (*Steklo i Keram.* 1952, 9 (12), 11-14—Dec.). A summary of this will be given later, embodying one or two proposed improvements. Use of shaking tables, too, has not been very efficient, though it may be applicable in some cases with white high-grade sands. These, however, are very rare, and hardly ever seen in factories belonging to the M.P.S.M. (probably Ministry for Constructional Materials). Flotation and washing, therefore, are most commonly employed. Other colouring oxides must also be considered, e.g. of Co, Ni, etc.

Recent experimental work in the Glass Inst., the Leningrad Mining Inst., the Far East affiliates of the Acad. Sci. U.S.S.R., geological and other institutes, has been mainly in favour of flotation-abrading. It is

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stated in Prof. M. A. Bezborodov's new book on the history of the Russian glass industry, 1952, p. 69, that this method of "wet friction" (abrading) was introduced by D. A. Kartsov about 1835-40. In the Russian original of Shlain's article is given a tabulated list of the principal quarries and of the chief glass works using the products, also content of Fe_2O_3 in raw and refined. According to E. I. Popova, working at the Glass Inst., iron oxide content can be reduced to 0.01 per cent. by first fine grinding (0.15 mm.) and then double flotation. With sands of relatively high feldspar content refining was more difficult, with up to 0.12 per cent. in the refined product. With sands from certain regions in Central Asia, Siberia, the Far East, and Trans-Caucasia, etc., containing feldspars and quartz, flotation has been facilitated by the use of cationic reagents.

In drying and cooling the use of centrifuges has reduced moisture content to 2.5-3.5 per cent., and by eliminating the need for drying drums has simplified the process, improved the quality, including reduced risk of iron contamination. Magnetic separation,

too, proves effective under the right conditions, and may be used with white high-grade sands to reduce iron content to 0.015 per cent. (as oxide); also for final treatment of concentrates from flotation. A special separator of the induction roller type must be designed for this purpose. After a few notes on dolomites, their iron and other impurities, and necessary treatment, the author proceeds to the important question of the Aral sodium sulphates, with a basic content of 89-94 per cent., of varying composition, and high moisture content.

From the glass-makers' point of view, considerable importance is attached to the so-called Aral sulphates or natural deposits of sodium sulphate in Russia, of which probably the best known are those of the previously mentioned Aral lake, north of the Caspian, and in the Priaralia region. At the recent conferences much time was devoted to discussing methods of production, e.g. by the Aral Sulphate Combine, and various suggestions for improvement were considered, in order to reduce cost of treatment at the factories, including more mechanisation. Surveys during 1951-52

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revealed very substantial reserves of sodium sulphate in Priaralia, where methods are to be used which will dispense with re-crystallisation at works. A comprehensive programme of research and development in the whole field of sulphate mining and treatment is contemplated during the next five to eight years. Most of the deposits are in the form of thenardite, and among other things it is intended to dehydrate the lakes, introduce pneumatic plant, etc., for elimination of dust—among other things, introduce modern plant for crushing and beneficiation, and so on. It is hoped thus to ensure for the factories adequate supplies of high-grade sulphate of 94-96 per cent. basicity and 1-2 per cent. moisture content.

Aluminous Materials

In regard to aluminous materials, it has been found that the pegmatite plant of the Londopozhsk factory is too remote from many of the glass factories, especially in the south. Other sources of these materials must be sought, with special reference to feldspar, for which the pegmatites hitherto have been regarded as the principal source. (Pegmatite in this connection appears a rather wide term, somewhat indefinite; presumably it is chiefly the orthoclase class that is intended.) The principal methods of refining and concentrating are magnetic separation with a fairly strong field, and flotation with cationic reagents, with separation of feldspar; thus expanding the sources of both aluminous and alkali material for the mix. Other interesting rocks here are granite, nepheline cyanites and others, especially the mariupolites (possibly related to mariposite or one of the micas) that are valuable sources of kaolin for the Prosyanovsk Combine. The development of new sources in the feldspar class is an urgent present problem, and generally also of new supplies of other basic materials such as quartz, carbonates, etc.

Another contribution to the raw materials conference was that of S. Ya. Raf, also of the Glass Research Inst., who dealt with the efficient storage of raw materials, wetting and general conditioning of batch, with homogeneous mixing and briquetting. Much yet remains to be done in some of the factories in the way of mechanisation and better methods. Experimental work at

the Institute had shown that the best mixing system was with an improved type of horizontal weigher-mixer, with paddle arms, needing only $1\frac{1}{2}$ to 2 min. for complete homogeneous mixing. Yet the more tedious and costly methods, with two or three kinds of machines in series, were still largely employed. Also the reducing and mixing of sulphate was often very inefficient. The author suggested improved methods, using 5-7 per cent. reducing agent.

Another important matter is that of wetting the mix, or the sand only, which should, of course, be done before mixing. A pamphlet on the subject had been sent by the Institute to the factories, but in many cases appears to have been ignored. The real purpose of wetting is briefly discussed, including both physical and chemical aspects. The whole question of raw material handling and treatment—sand and sandstone, dolomite, sulphate, etc., should be thoroughly reviewed by the Glass Institute in collaboration with other bodies, industrial and scientific. In some cases where the factories have their own works laboratories these could often be used to better advantage: with less delay in issuing test results and better use of them when issued. Some fairly obvious suggestions are made in regard to analyses and their purpose. More rapid analytical methods are being developed by the Institute.

Briquetting Method

Several advantages are claimed for the much debated but little employed briquetting method for the mix, which as yet appears to have been very indifferently adopted. It has nevertheless been the subject of much research which has established among other things: (a) reduced or eliminated risk of stratifying and difficulties with volatile matter, with more homogeneity in the glass; (b) better preservation of moisture content. Briquetting is still being studied at the Institute in order to determine more definitely optimum conditions and the most efficient type of press.

Finally, the need for revising existing standards is emphasised. The rules established by a Technical Committee of the Ministry (of Construction Materials) in 1949 are now out of date, and new ones are required.

FINNISH POTTERY AND GLASS

The Arabia and Notsjö Works

by

JOHN GRINDROD, B.A.(Com.)

PRODUCED by Finland's giant Arabia Potteries at Helsinki and her sister company, the Notsjö Glass Works, respectively, an exhibition of Finnish pottery and glass has recently been staged in London. Shown for the first time in England, in collaboration with Finmar Ltd., the exhibition was held in May at Heal and Sons show-rooms and was representative of the kind of pottery and glass being produced in Finland today.

Scope

These two firms, along with the ÅBO Technical Porcelain Factory, all three of which are part of the Finnish combine Wärtsilä-koncernin A/B, are responsible for the production of more than 100 tons of technical porcelains, refractories, fine chinaware and pottery and glassware daily. Output of finished products includes some 45,000 plates, 40,000 cups and saucers, 10,000 bowls and ovenproof ware and 3,000 jugs each day. Not only do they supply practically the whole of the home market, but their exports go to no fewer than thirty foreign countries as well.

Now claimed to be one of the largest potteries in Europe, Wärtsilä-Arabia is also one of the few in the world with an inclusive production of household goods in feldspathic porcelain and earthenware, objets d'art individually created, hand-painted exclusive giftware, vitrified sanitary ware, façade tiles, refractory bricks for home and industry, electrical porcelain and other goods for varying purposes. It is situated on the Baltic shores of Finland's capital, Helsinki. Wärtsilä-Notsjö, Finland's oldest glass factory, has been producing fine crystal from its woodland location for 160 years.

So noteworthy has the progress in the

manufacture of pottery been in Finland over the past three-quarters of a century that a description of the Arabia potteries, the only one in Finland, both from the point of view of production and of their creative work might be of interest to other manufacturers and traders.

Established in 1874 as a branch of the well-known Swedish Rörstrand porcelain works, the Arabia potteries stand on the site of a villa built by a general, who had spent much time in Arabia. It was originally intended to cater chiefly for the Finnish and Russian markets and employed rather more than a hundred workers, about twenty of whom were craftsmen from Rörstrand.

Extensions and Modernisation

After 42 years of working in co-operation with the Swedish firm, during which time the company had experienced varied fortunes, the connection was terminated in 1916. This was brought about by Mr. Carl-Gustaf Herlitz, who had just become managing director, in which capacity he continued until 1947, when he resigned, to be succeeded by Mr. Gunnar Ståhle. Once the works were entirely in Finnish hands a programme of extension and modernisation was carried through and electricity was introduced as a source of power. The modern chemical laboratory, inaugurated in 1922, where materials and processes became subjected to scientific investigation and research, proved of great value to the factory. In 1923 feldspar porcelain replaced bone porcelain and the ÅBO Porslinsfabrik Ab. was acquired in 1924 for the production of technical porcelain.

A steadily growing demand more than matched this rapid development and

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further enlargements became necessary. The management then had to choose between the addition of new round kilns or the construction of a continuously-fired tunnel kiln, a type still unknown in Finland. The latter was decided upon, and, in 1929, Arabia's first tunnel kiln, the largest of its type in the world, was completed. Measuring 122½ yards in length it had room for 60 firing cars, each with cubic contents of 194 cu. ft. The construction of this new kiln also made necessary the erection of a new five-storey factory building for work



rooms and its use placed Arabia within the orbit of big business. Mass production methods began to be adopted.

For instance, as soon as the new tunnel kiln was brought into use the production of sanitary ware was modernised. The manufacture of these products had begun in 1900 but modelling was done by hand and only two W.C. pans, for instance, could, up to then, be completed each day. Now, large-scale production was planned for various kinds of sanitary ware, except bath tubs, which the factory does not make. At present about 1,000 articles are cast daily.

The production of refractories was also begun on a large scale. So far, these had been made only for the firm's own requirements. Both standard refractories for the market and those for special purposes have been made ever since, the daily output of the former now running at 19,000 pieces, while some 1,200 tons a year of special refractories are produced. The latter includes 15,000 fuel-saving ovens for the heating of dwellings.

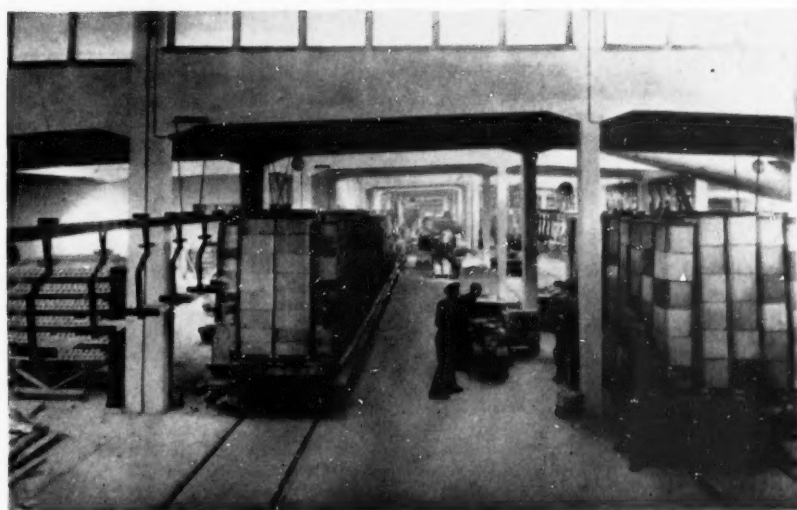
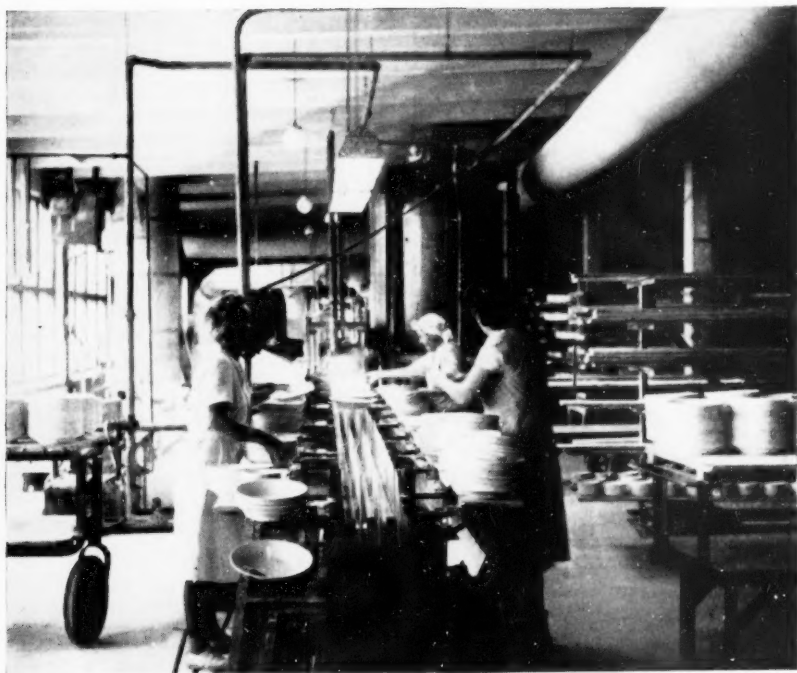
Economic Difficulties

Country-wide economic difficulties were, however, encountered almost as soon as the new tunnel kiln had been installed. Purchasing power diminished and consumption in the home market fell. To keep the enlarged factory running to capacity it was decided to accept large orders from abroad in spite of very low prices. Production methods were improved and simplified. By dint of laboratory research and investigation it was found possible to fire about 60 per cent. of the products only once and yet produce as good quality articles as those previously fired twice and even three times. This saved one-third of production costs and allowed the factory to carry on without loss.

Incidentally, Arabia products are fired at higher temperatures than those of many other ceramic works. For instance, for the firing of unglazed ware and those fired only once a temperature of 2,336° F. is used, while 2,156° F. is used for glazed goods and 2,516° F. for feldspar porcelain.

This discovery, which cut down unnecessary firing, was one of many results achieved by the constant endeavour to reduce costs and improve the quality of Arabia's products. In this the laboratory played an outstanding part. Soon the company found that they could sell their products on quality alone. At the same time rationalisation of production led to economies of time and labour. Time and motion study was introduced and operatives were given the best facilities and equipment for their work. Progress was rapid. Output increased enormously, while costs of production fell. The workers got the advantage of better earnings and shorter hours.

To cope with the increased volume of work another tunnel kiln, of the same size as the first one, was begun in 1936 and a new wing added to the factory.



CERAMICS

This work was completed in less than nine months. It was followed, in 1941, with the beginning of the construction of an additional building of ten storeys to provide more work room. Completed in 1943, this wing also housed a new decorating kiln, which had double the capacity of the existing kiln. Further expansion was still necessary, and, in 1942, the most extensive programme was begun in spite of difficulties then being experienced over the supplies of materials, machinery and equipment. This involved the construction of a gigantic block of factories, which were opened in 1946. Additional equipment included two new tunnel kilns, 131 yards and 62 yards in length. By now, the factory has in use three tunnel kilns measuring over 120 yards in length, the firing cars of each kiln having a cubic contents of 194 cu. ft., as well as one tunnel kiln 62 yards in length, whose firing cars have a capacity of 56½ cu. ft. Notwithstanding their greater running costs six of the old type round intermittent kilns are still in use at Arabia, three being used for firing feldspar porcelain and three for faience work. Compared with the modern tunnel kiln it is estimated that production time totalling approximately 25 hours is lost while the intermittent round kiln is being brought up to the required heat, while cooling requires another 24 hours. Two tunnel kilns are used for the decorating process.

Today

During the last quarter century the Arabia works have grown into a vast complex with a cubic content of 588,600 cu. yards, or 31 acres of floor space. Some 2,500 employees are now listed on the firm's payroll.

About 80 tons of ceramic bodies are now made each day. 65 tons of batch for saggars and 65 tons for refractories. Seven tons of gypsum are used daily. The sagger capacity of the kilns is 22,951 cu. ft. each 24 hours, and the daily consumption of pit props is 8,827 cu. ft.

About half the raw materials used at Arabia, viz., quartz and feldspar, are obtainable from Finland. The remainder must be imported. Of these the most important are clays and china clays, which are brought from Great Britain, Czechoslovakia, Russia and Germany.

Since the cost of raw materials is low compared with the cost of converting them into finished products the necessity of bringing them from a distance has not been found to be a serious detriment.

Production Methods

The usual production methods are practised, namely, moulding, casting and throwing. Decorating is done by underglazing and overglazing.

After being weighed and mixed according to varying formulae the raw materials are diluted with water and finely ground. The slip passes through magnets for purification and is stored in large vats. From these vats it is piped to filter presses for removal of the water. The pressed clay cake, containing 23 per cent. water, is then put into a pugmill for de-airing, the exuded round column being cut into appropriate lengths for the jigger shops. Here, symmetrical objects such as cups, saucers, plates, etc., are shaped on gypsum moulds, whereas holloware such as teapots, tureens, etc., are cast from slip. During the pre-firing drying process the ware shrinks about 3.5 per cent. During biscuit firing at 2,336° F., it shrinks another 10-12 per cent. during the period of about 40 hours in the tunnel kiln.

Each piece is carefully checked by a skilled worker for deformations, iron spots, cracks and other imperfections before being passed either for decorating or glazing. The glaze is applied either by hand dipping or by spraying in glazing machines, after which the ware is glost-fired for about 25 hours at a temperature of 2,156° F.

Underglaze decorating is applied to both unfired and biscuit-fired ware, such colours being used as will stand high temperatures. Overglaze decoration is fired at only 1,472° F. and allows opportunity for the use of different shades of colour. On-glaze patterns are often hand-painted and decalcomanias are much used. Often a combination of both methods of decoration is used at Arabia. For instance, in the production of certain decorative novelties of dyed faience, which has its special attraction, decorating is done by hand-painting on glazed but unfired goods.

The various methods of applying the decoration are used.

The Grand Prix was conferred on

Arabia's products at World Exhibitions in Barcelona (1929), Salonica (1935) and Paris (1937).

Although production at the Wärsilä-Notsjö Glass Works is on a very much smaller scale than at the Arabia Works the manufacture of fine crystal ware serves to supplement the porcelain and dinner ware produced at the larger factory. When, therefore, the opportunity came for Arabia to acquire this oldest established Finnish glass works it was happy to amalgamate the two into one production unit. At the Notsjö works, which are housed in old-type factory buildings and warehouses in the heart of a wooded countryside, craftsmen and artisans have been producing glassware for over a century and a half.

Cutting, engraving and a variety of techniques, old and modern, are employed. While some pieces are made in a limited number only, others, such as hand-blown vases, bowls, tumblers, etc., are produced on a large scale.

Especially in recent years it has been the aim of both companies to make their products blend with current artistic conceptions of the home. It has been discovered how fine crystal can bring out the beauty of ceramic pieces, and, conversely, how fine dinner ware can enhance the charm of crystal. This, together with a happy blending with furniture and textiles, is being achieved by simplicity of shape and design and by the inherent beauty of the materials used.

SOUTH AFRICAN NEWS

Standardisation of Salt-glazed Pipes

THREE of South Africa's largest manufacturers of salt-glazed ware pipes and drain fittings have recently received permission to apply the standardisation mark to their range of products covered by the standard specification for these commodities. The firms are: Messrs. Consolidated Rand Brick, Pottery and Lime Co. Ltd., of Olifantsfontein, Messrs. Hume Pipe Co. (S.A.) Ltd., of Koelenhof, and Messrs. Vereeniging Brick and Tile Co. Ltd., of Vereeniging.

Salt-glazed ware products are already being exported to other African territories, but the presence of the standardisation mark on drain pipes and fittings should induce more foreign buyers to purchase these commodities as it signifies approval by the South African Bureau of Standards. It means that samples of the product, taken at the factory and acquired from retailers and other stockists, are regularly tested and inspected and that a system of quality control to ensure unflinching production to the quality level laid down in the specification, is in operation in the factory.

Both manufacturers and purchasers will undoubtedly benefit from the use of the SABS mark on salt-glazed ware pipes and drain fittings. The former will be able to receive full recognition for quality products and the latter will be relieved of the burden of individually inspecting their own orders.

Glazed Wall Tiles Made in Union

A new £150,000 factory is to produce high-quality glazed wall tiles at Olifantsfontein, in the Pretoria district, and it is hoped that full-scale production will begin soon. This project is the culmination of five years of planning, to which the British

associated company of H. and R. Johnson Ltd. has made a major contribution.

The factory will produce a complete range of 6-in. tiles, as well as 6-in. by 3-in. capping tiles in bright enamels, matt, dull or eggshell and mottles giving 18 different colours. It is forecast that within the next two years there will be no necessity for South Africa to import tiles from overseas.

S.A. Company Making Shaped Glass

Manufacture of curved, bent and shaped glass of all types is now being carried out by United Bent Glass Corporation (Pty.) Ltd., of Johannesburg. The company, which employs a staff of technical experts, is installing new and modern electric furnaces to cope with the increased demand.

Ceramics at Rand Show

A number of South African firms provided displays of ceramics at the Rand Show, Johannesburg, recently, and a gold medal was won by the Grahamstown Potteries Ltd., whose exhibit included "Drostdy" decorative and utility pottery.

S.A. Glazing (Pty.) Ltd. displayed some particularly attractive new lines. Another gold medal was won by Flora Ann (Pty.) Ltd., who also gained a trophy for the best display of South African manufactured products.

A British Standard for polythene tube for general purposes, including chemical and food industry uses, is available. It is B.S. 1973/53. Polythene tubes in black, white, and natural, are provided for in composition, dimensions, limits and testing features for various weights. Price 4s. from 24 Victoria Street, London, S.W.1.

STUDYING BRITISH BRICK MAKING

MR. SETRAK BALIAN, a pottery manufacturer from Jordan, arrived in the United Kingdom early in May on a three-months' bursary awarded to him by the British Council to study brick- and pipe-making. Mr. Balian's father's factory in Jerusalem is the only pottery works in Jordan and he is interested in studying British methods with a view to modernising the factory. He proposes to continue his studies here for a further three months after the termination of his bursary.

Mr. Balian will see various kinds of brick-making and glazing and equipment such as kilns and waste-heat dryers. He was attached to W. C. French's Hallsford brick-works at Ongar until the end of May and has since visited other firms. He hopes to tour the Stoke-on-Trent potteries. Later he will study museum pottery collections, including those of the British Museum and Victoria and Albert Museum.

SOCIETY OF GLASS TECHNOLOGY

SCOTTISH SECTION

TECHNICAL and scientific personnel engaged in the Scottish glass and allied industries met in the Central Station Hotel, Glasgow, recently, under the chairmanship of Mr. John Currie, Alloa, and unanimously decided to inaugurate a Scottish section of the Society of Glass Technology.

In the newly constituted Scottish section, Mr. Currie was appointed chairman with J. F. Turnbull, Alloa Glass Works, and G. H. Thompson, Scottish Central Glass-works, as joint hon. secretaries. An executive committee, composed of a representative from each of the Scottish glassmaking centres was also elected. It will be the task of the officials and committee to make arrangements for suitable subjects of discussion at meetings to be held periodically during the ensuing winter session in each of the various glassworks areas in Scotland.

"FLOWSTRUT"

A NEW venture in standardised universal construction units is marketed under the name "Flowstrut." These follow the "Meccano" principle and have a slotting perforation for easy adaptation and assembly. A wide variety of useful pieces of equipment may be assembled from the units, including benches, store bays, small buildings, etc.

In addition to the slotted sections, panels are available for cupboard-type construction, whilst suitable hinges can be supplied for doors. The sections are of angle steel, rustproofed and stove enamelled in battleship grey. To each foot length of angle there are forty slotted holes, and cutting marks are provided at $\frac{1}{4}$ -in. intervals.

The following further accessories are supplied with the units: standard bolts and nuts for fixing; castors and wheels for mobility; a tool kit which is composed of a double-ended ring spanner and cutting shears. The "Flowstrut" is a product of Fisher and Ludlow Ltd., Material Building Division, Bordesley Works, Birmingham 12.

ANTI-SLIP FLOOR COVERING

THE Minnesota Mining and Manufacturing Co. Ltd., Arden Road, Adderley Park, Birmingham 8, are the makers of "Safety-Walk" type "A" anti-slip floor covering. Under the same trade-mark the company has added their type "B" surfacing. This latter is self-adhesive and may be employed where the floor surface is clean, dry and level.

Self-adhesion is obtained without the use of water or any special preparation. The material is produced in four standard sizes: 6 in. \times 24 in. for normal surfaces; 5 $\frac{1}{2}$ in. \times 5 $\frac{1}{2}$ in. for tiled flooring; 4 in. \times 8 $\frac{1}{2}$ in. for overlaying brick floors; and stairway strips of $\frac{3}{4}$ in. \times 24 in.

The strip method of application allows for easy fitting to walkways, floors, corridors, and so on, and easy replacement when that is necessary to worn parts. The material, which is rolled or hammered to the surface being covered, has a backing sheet to protect the adhesive side. This backing sheet is removed immediately before application.

It is claimed that the material is unaffected by temperature extremes, is durable, and suitable for industrial establishments as well as domestic usages. Made of extremely hard mineral grains coated to a heavy, tough, treated fabric, "Safety-Walk" may be used where normal wheeled internal transporters are used.

ELECTRONIC pH METER

A COMPLETE range of pH measurement meters and electrodes claimed to give high accuracy in many fields of application including research laboratory work and industrial pH control, are illustrated in a folder issued by the makers, Electronic Instruments Ltd., Red Lion Street, Richmond, Surrey.

FOR SALE

OLD BROKEN STEEL WORKS FIREBRICKS, hand cleaned, regularly for sale. Thomas Mouget and Co. Ltd., 24 Cornfield Road, Middlesbrough.

APPOINTMENT WANTED

CERAMIC RESEARCH AND CONTROL.—Male Graduate, four years' experience of ceramics, seeks position offering scope and prospects of greater advancement.—Box No. 22, CERAMICS, 157 Hagden Lane, Watford.

WANTED TO BUY

FIRE BARS of the usual 750- and 1,000-watt type required, in fairly large quantities, not the pencil type. Any stocks would be purchased and paid for immediately.—Apply: Box No. 23, CERAMICS, 157 Hagden Lane, Watford.

APPOINTMENT VACANT

GRADUATE CHEMIST required with some knowledge of silicate technology for research work in the development of vitrified grinding wheel bonds. Age 20-25. Apply: Research Manager, Universal Grinding Wheel Co. Ltd., Stafford.

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- (b) Ceramists for appointments abroad, able to control staff and direct technical development on own initiative.

Personnel of the Company advertising who are likely to be suitable candidates have been informed of this advertisement.

Applicants should write giving in detail a history of their career to "Ceramist," c/o Pritchard Englefield & Co., Solicitors, Painters Hall, Little Trinity Lane, Queen Victoria Street, London, E.C.4.

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CERAMICS

EARTHENWARE COFFEE MAKER

A FULLY automatic coffee maker, the "Auto-Perc," by Falk, Stadelmann and Co. Ltd., made in porcelain and styled to harmonise with the hostess' well-laid table. This departure represents a basically new development in domestic electric



appliances. The approach has made it possible to use an automatic electric appliance in dining-room or drawing-room without offending the atmosphere with the looks of an "engineer designed" gadget.

The technical features of Falks "Auto-Perc" are already well known; it makes coffee without personal supervision and keeps hot until the hostess requires it. Fill it with water and coffee, switch on and the "Auto-Perc" will then look after itself. It will switch itself off when the coffee is made and keep it at the right temperature.

Average capacity—1½ pints; loading—560 W., A.C. only.

Honeywell-Brown Ltd.—As a further step in their policy of providing an improved service for their clients, Honeywell-Brown Ltd. have established a new branch office at Sheffield. The address of the new office is: 20 Oak Dale Road, Nether Edge, Sheffield 7. (Telephone: Sheffield 53093.)

Elliott Bros. (London) Ltd.—Elliott Bros. (London) Ltd., manufacturers of electrical, electronic and process control instruments, announce the transfer of their Newcastle branch office as from 1st June, 1953, to larger and more modern premises at 36 Scotswood Road, Newcastle-on-Tyne. (Telephone: Newcastle 23811.)

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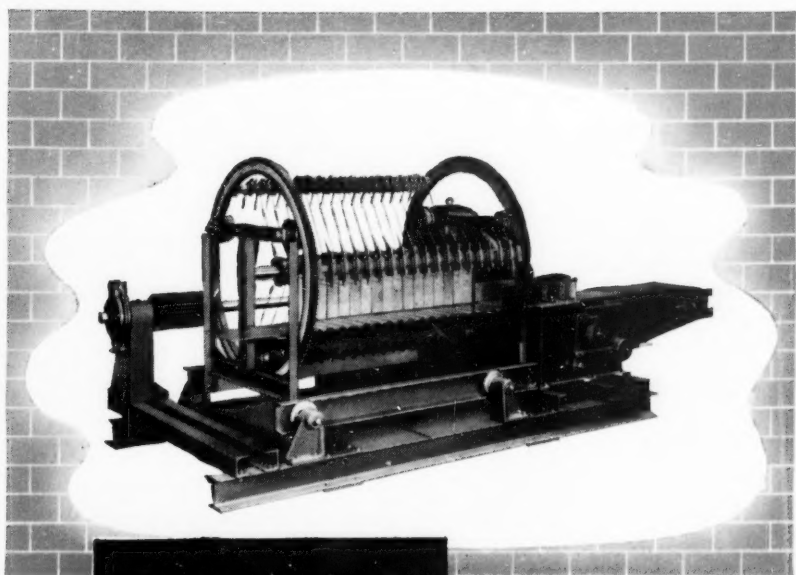
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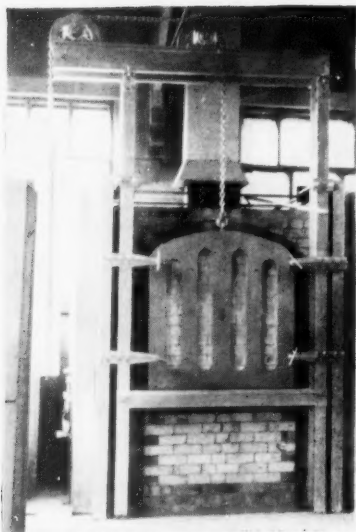
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